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MATERNAL AND NEONATAL OUTCOMES ASSOCIATED WITH
SELECTED INTRAPARTUM INTERVENTIONS

by

JANICE KELLER KVale

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

Thesis Adviser: Claire M. Andrews, C.N.M., Ph.D., F.A.A.N.

Frances Payne Bolton School of Nursing
CASE WESTERN RESERVE UNIVERSITY
January, 1995
CASE WESTERN RESERVE UNIVERSITY

GRADUATE STUDIES

We hereby approve the thesis of

Janice Keller Kvale

candidate for the Doctor of Philosophy degree.*

(signed) (chair)

Cecil C. Anderson

May Wykle

StEllen Fiack

date 5/24/94

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MATERNAL AND NEONATAL OUTCOMES ASSOCIATED WITH SELECTED INTRAPARTUM INTERVENTIONS

Abstract

by

JANICE KELLER KVALE

The purpose of this research was to investigate the cumulative impact of the number of different invasive interventions commonly employed to provide comfort, timeliness, and safety during intrapartum. The universe sampled was low risk women anticipating an uncomplicated labor. Four null hypotheses and one research question were proposed.

1. The number of different invasive intrapartum interventions (NODI) and neonates’ Apgar scores are not correlated.

2. NODI and neonates’ Hobel morbidity scores are not correlated.

3. NODI and fetal stress reactivity are not correlated.

4. NODI for parturients with vaginal births and parturients with cesarean births does not differ.

5. Is there a relationship between NODI and physiological distress experienced by parturients during hospitalization for childbirth?

A random sample from the 1993 census at MacDonald Hospital for Women, University Hospitals, Cleveland, Ohio included 122 vaginal and 8 cesarean births. With SPSS-WIN, parametric statistics were used to analyze the data. All null hypotheses were rejected. For the research question, NODI was significantly associated with physiological distress (p < .001).
Demographic and control variables significantly associated with NODI were ethnicity (p = 0.05), parity (p < .001), employment (p < .01), hospital length of labor (p < .001), epidural (p < .001), and care provider (p < .01). These demographic and control variables were tested as confounders for the outcome variables. For lower Apgar scores and increased fetal stress reactivity, a greater NODI was the single significant predictor. Longer hospital length of labor (HLOL) and a greater NODI remained associated significantly with higher Hobel morbidity scores and increased physiological distress of parturients.

For cesarean birth, four univariate statistics representing NODI (p = <.01), parity (p = 0.04), HLOL (p < .001), and epidural (p = 0.02) were significant. Only HLOL remained predictive of cesarean birth after discriminant analysis. This analysis was compromised by the small cesarean birth sample (n = 8).

Conclusions were that a greater NODI was associated with lower Apgar scores, greater neonatal morbidity, increased fetal stress, and increased physiological distress for parturients. NODI has potential as an important new measure for perinatal outcome research. Refinement and further research with this variable is recommended.
This dissertation is dedicated to my husband,

James N. Kvale, M.D.,

whose encouragement and support were immeasurable.
The kind and expert guidance of my dissertation committee is acknowledged. Thank you.

Claire M. Andrews, CNM, PhD, FAAN
Gene C. Anderson, PhD, FAAN
May Wykle, PhD, FAAN
Stephen J. Zyzanski, PhD
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CHAPTER 1 - PROBLEM

The purpose of this research was to investigate the cumulative impact of the number of different invasive interventions commonly employed to provide comfort, timeliness, and safety during intrapartum. In this chapter, the problem statement is followed by a description of the organizing framework. Independent and dependent variables are identified. The hypotheses and framework are supported by background literature. The appropriateness of this research within the context of applied and theoretical midwifery and nursing is defended. Explanatory and operational definitions appear in the text and have been cross referenced in a glossary (Appendix A).

Background

The terms technology and intervention appear often in this chapter, both separately and linked. According to the Random House Unabridged Dictionary, technology is the method or process used to apply scientific knowledge (Stein, 1973). In common labor room parlance technology implies complex monitors and other equipment, but it can be as simple and effective as repositioning a patient for a specific reason based on scientific principle. Technology also can refer to the sum of ways in which care is provided for the laboring woman, some of which may not be scientific.

Intervention describes an object or action that modifies or mediates something else (Stein, 1973). Defined for the purposes of this research, an
invasive intrapartum intervention is any intervention that crosses an anatomical barrier as categorized in the typology of interventions and that may immediately or over time destabilize normal physiological function of the parturient woman or fetus in some way. The intervention may cause a) pain or discomfort unrelated to labor or excessive for labor; b) unphysiologic side effects; and/or c) additional risk to the parturient or fetus. Interventions which are invasive often accompany sophisticated technology and devices.

Interventions during labor and birth can be categorized as supportive, corrective, or preventive. Supportive interventions are those that support the natural course of events as long as cues reassure of normal progress. Should the perceived cues during the course of events become alarming, corrective intervention may be used. Corrective interventions are used to alter the alarming aspect of the situation in order to maintain balance within the boundaries of normalcy. Both supportive and corrective interventions may be used preventively or correctively as indicated by the evolution of the event. For example, the clinician may interpret a temporary slowing of progress during labor as a normal variant of labor. Interventions may be supportive comfort measures, nutrition, and hydration while expectantly watching the situation until the body regroups and reenergizes. Another clinician may interpret the same cues and choose to rupture membranes as a means of stimulating labor. Progress and outcome of labor requires an element of time
to transpire. Interpretation of supportive interventions, corrective interventions, appropriate length of the time element, and normalcy varies widely in practice.

Problem Statement

Many long-accepted and traditional interventions intended to facilitate comfort and timeliness to the parturition of low risk women in contemporary western culture are neither clearly efficacious, cost effective, nor scientifically grounded. This brings into question the safety and rationale for such interventions (Anderson, 1977; Broach & Newton, 1988; Chalmers, Enkin, & Keirse, 1989; Douglas, 1988; Grant, 1989; Johnson, Keirse, Enkin, & Chalmers, 1989; Lewis & Crawford, 1987; Newton, Newton, & Broach, 1988). Some common standards of practice have no scientific foundation either to affirm or deny their usefulness and safety. Grimes (1993) equates a protocol for bloodletting to relieve eclampsia described in a 1920s William's textbook of obstetrics to some commonly used technologies in modern obstetrical medicine, claiming they will appear similarly barbaric to practitioners in the next century. When there is no clear scientifically supported direction for clinical management, practitioners are most comfortable adhering to the values of the peer group (Shearer, 1989).

The paucity of research to substantiate current standards of practice is a consistent message from the contributors to Chalmers, Enkin and Keirse's (1989) two volume meta-analysis on the effectiveness and safety of
commonly used interventions for pregnancy and childbirth. In reviewing the Chalmers et al. seminal meta-analysis, Warren (1993) states, "Only 35 percent of the 283 interventions examined were demonstrably beneficial; of the remainder, 22 percent were found to do more harm than good" (p. 3). Considering this, many interventions imposed for the mother and fetus during labor should be used selectively and only when there is clear benefit to the mother or fetus (Grant, 1989).

As society and health service delivery became more complex and professional caregivers increasingly enamored with costly technology (US Department of Health and Human Services, 1990), intrapartum interventions also became more invasive and indiscriminate. While complex technology is expected and may be life saving when parturients are high risk, this technology also is used for low risk parturients, even in the absence of risk factors. An indicator of this trend may be the sharp rise in the incidence of cesarean birth in recent years. Injudicious use of invasive technology in the absence of risk factors or cues indicating potential unfavorable outcome may precipitate a cascade of interventions culminating in an instrumental or cesarean birth. Marieskind (1989) documented a rise of 442.2% in the cesarean birth rate from 1965 to 1987, and Zahniser, Kendrick, Franks, & Saftlas (1992) documented a 48% rise from 1980 to 1987.
Standards of mortality and morbidity are necessary but insufficient as outcome measures by themselves, particularly for the developing fetus and newborn. Quality of life is the standard for the future. Out of 1,000 babies, 10 will die but the other 990 live (US Department of Health and Human Services, 1990). "Some of those who live have been harmed, often permanently, by unhealthy beginnings. The quality, not just the quantity, of their lives is a function of health during both the prenatal and infant periods" (p. 9).

The science that has brought the technology of the birthplace to this point may be too narrowly focused toward prevention of pathology to encompass the broader scope implied in a standard for quality of life. Research on the quality of the labor experience for mother and fetus and the impact of that experience on recovery is meager. Insufficient attention is paid to interventions that hinder optimal mother-baby bonding and successful breastfeeding (Anderson, 1989).

In a published version of a panel discussion on primary care research for the future, the panelists called for a new paradigm or structure of primary care research that is multifocused and horizontal. The panel urged collaboration of multiprofessional care providers to focus on "breadth of activity, on themes, on teamwork, or on multiple topics" in research and to eschew reductionism (Bain et al., 1992, p. 230). Outcome research is needed
that focuses on the breadth of morbidity that compromises quality of life. It is particularly appropriate for a childbearing population with many years of life ahead.

Purpose

The purpose of this research was to investigate the cumulative impact of invasive interventions commonly employed to provide comfort, timeliness, and safety during intrapartum. Outcome research often focuses on a single problem or phenomenon as a causal event of poor outcomes. With a macroscopic perspective, this research was focused on the cumulative impact of multiple interventions for what began as low risk intrapartum care. No research was found that attempted to measure the impact of multiple interventions, but sensitivity to multiple interventions and invasive technology was present in the literature. The phrase "cascade of interventions" or "cascade of technology" appears sporadically in professional and lay literature. From a survey of obstetric practice in Australia, MacLennan (1978) noted that rates of intervention in labor had increased with no improvement in perinatal mortality. Speaking specifically about induction of labor, he suggested that "a radical policy of induction is at risk of producing a cascade of intervention, the benefits of which have not yet been proven and the disadvantages of which are becoming more evident" (p. 288). MacLennan's
phrase (if he originated the expression) was picked up soon in lay literature
critical of invasive technology for the birthplace (Inch, 1984).

Organizations world-wide have become sensitive to the issue of
appropriate technology for health care. Acknowledging the increasing role of
complex technological interventions in childbirth and nurse-midwives'
expanding scope of practice, the American College of Nurse-Midwives
recently issued a position statement on appropriate use of technology in
childbirth (ACNM Board of Directors, 1992). In a synopsis of the technical
discussion on women's health at the Forty-Fifth World Health Assembly, the
discussants noted that neither preventive nor curative technology is sensitive
to the particular physical and emotional needs of women. Interventions are
often cumbersome, insensitive, and harmful (World Health Organization,

Generally, costs and risks are not considered with introduction of new
technology into the health care armamentarium (Stauning, 1994). Adequate
assessment of technology is expensive, time-consuming, and, unlike drugs,
not controlled by a watch-dog agency (Grimes, 1993). Furthermore, medical
research is supported by the industrial complex that profits from the marketing
of technological innovations. Clearly the problem is one of both health care
policy and ethics. More pertinent to this particular program of research, the
evaluation of the efficacy of technological innovation is not linked to the
decision-making process that applies technological intervention to clinical management (Stauning, 1994). While Stauning suggests the medical-industrial complex bears responsibility for the technology epidemic, others have focused on the place of birth (McKenzie & Stephenson, 1993; Rooks, Weatherby, & Ernst, 1992a; Tew, 1979;), the discipline of the care provider (Baruffi, Strobino, & Paine, 1988), and the culture of developed civilizations (Notzon, 1990; USDHHS, 1990). All of these inferences of causality are grounded on the operation of opposing philosophical paradigms or world views. This proposition will be expanded in the review of literature.

Organizing Framework

Cascade of Interventions

The organizing framework for the proposed research was drawn from clinical practice, preliminary work in concept analysis, development of a typology of interventions, and review of professional literature. Interventions have been investigated as single specific acts (Broach & Newton, 1988; Chalmers, Enkin & Keirsh, 1989; Harding, Elbourne & Prendiville, 1989) and/or as a pattern of several interventions (McDonald, 1990) implemented consciously or subconsciously in a consistent way by an individual caregiver or group of caregivers. Various authors have proposed that an initial invasive intervention carries with it a commitment to continue an invasive level of technology leading to the "cascade of interventions" (Keeler & Brodie, 1993;
MacLennan, 1978; Oakley, 1983). Each intervention adds potential insult to the parturient and fetus.

An assumption of this research was that the impact of multiple invasive interventions is interactive and cumulative resulting in outcomes that are less than optimal. Another assumption underlying this investigation was that the greater the number of invasive interventions in low risk childbirth, the less favorable the outcomes will be for mother and neonate. In other words, outcomes are a function of input, both in quantity and quality. Epidural analgesia for childbirth is presented as an examplar of a trigger for the cascade of interventions and the outcomes that might follow (Figure 1).

**Balance**

Balance is a concept drawn from Eastern philosophy and Greek medicine (Ladd, 1979). It is a common theme in theoretical models of nursing (Johnson, 1961; King, 1981; Parse, 1987). The body and mind are dynamic and constantly adjusting to maintain a range of healthy homeostasis. Intrapartum physiology can be supported or unbalanced by the interventions imposed during labor and birth. When interventions unbalance intrapartum physiology, the body reacts in an attempt to regain dynamic homeostasis with a response that is opposite and equal to the disruption that has occurred. Care providers may introduce more interventions to counter the unfavorable
Figure 1. Epidural analgesia as an exemplar of a cascade of interventions.

Fetal
- Reactive Neonatal Hypoglycemia from Maternal Glucose Load
  - Loss of Mobility
  - Loss of Protective Amniotic Fluid Cushion
    - Decelerations
    - Amniocentesis
    - Fetal Scalp Electrode
    - Fetal Hyperthermia
    - Tachycardia
    - Acetaminophen
    - Bradycardia
      - Oxygen
      - Sepsis Workup Drugs
      - Depressed Neonate
        - Low Apgar
        - Resuscitation
        - Increased Injury from Assisted Birth
        - Increased Morbidity
        - Increased mother-baby separation
        - Poor Feeding
        - Impaired Bonding

Maternal
- Hypotension
- Inadequate Fluid Load
- Inadequate Pain Relief
- Redose / Restart
  - Drug Reaction
    - Nausea & Vomiting
    - Increased Risk of Infection
    - Long Term Sequelae Risk
    - Back Pain
- Other Drugs
- Increased Risk of Infection
- Intrauterine Pressure Catheter
- Terbutaline to Relax Uterus
- Loss of Sensation below Waist
  -Unable to Void
  - Catherization
  - Increased Risk of Infection
- Inadequate Pushing
- Insufficient Pelvic Floor Resistance to Rotate Head
- Maternal Exhaustion
  - Vacuum Extraction
  - Forceps
  - Episiotomy
  - Cesarean Birth
response, sometimes further compounding the imbalance. Ultimately, the sequential introduction of multiple invasive interventions may produce an iatrogenic spiral or cascade.

Intrapartum physiology in normal labor was conceptualized as in perfect balance for the parturient state. Interventions should follow and support the physiological evolution of labor and birth. When interventions are introduced before any cues indicate pathology, the body's physiology may become unbalanced precipitating the cascade of interventions. The conceptual model in Figure 2 depicts the balance of interventions and outcomes within the context of low risk labor and birth.

Figure 2. Conceptual model of interventions and responses (outcomes) in the context of labor and birth.
Significance to Nursing

This research is important to nurses as care providers of influence in decisions related to childbearing. In most institutions, nurses are the care providers responsible for managing labor and making decisions about the choice of interventions, including those defined by medical protocol for use in response to the progress of the parturient's labor and birth. Nurses knowledgeable about the risks and benefits of legitimate uses for invasive technology are in a position to make appropriate decisions and to articulate this knowledge when and where it best advocates for the parturient and the neonate (Cook, 1994).

Nursing's unique health-centered perspective for childbearing women was clearly articulated by the founder of professional nursing in the western cultures. Florence Nightingale observed, "Lying-in patients ... should be perfectly well in health. Since lying-in is not an illness, and lying-in cases are not sick cases, it would be well, as already said, to get rid of the word 'hospital' altogether, and never use the word in juxtaposition with lying-in women, as lying-in women should never be in juxtaposition with any infirmary cases. Lying-in is neither a disease nor an accident ... " (Nightingale, 1871, pp. 73-74).

Nightingale defined the nurse's responsibility to "put the patient in the best condition for nature to act upon" (Nightingale, 1910, p. 133). The nurse
followed the natural course of events (labor) knowing how and when to alter
an existing situation appropriately. The implication was that the nurse
manipulates the environment of the patient to facilitate the "best condition".
Nightingale, following the physiological cues of the laboring woman, would
use supportive interventions. The environment of the lying-in woman is in a
healthy balance, and the nurse's role is to maintain that balance. The
caregiver uses skills of observation backed by prior experience to maintain
health and prevent illness (Nightingale, 1910).

Nightingale's conceptualization of nursing was used in this research as
the basis for investigating the association between the balance of the internal
environment (physiology) with that of the external environment (birthplace
technology), and the outcomes for the lying-in woman and her offspring.
Essentially Nightingale's approach is noninterventionist (Appendix A) in terms
of not manipulating the labor of the individual with drugs and procedures,
since that would not be natural or physiologic. Nightingale's conceptualization
incorporates all four components of the metaparadigm for nursing articulated
by Fawcett (1984) and has generated testable hypotheses appropriate for
nursing practice (Reed & Zurakowski, 1989). The findings of this particular
study are applicable for practitioners of obstetric medicine also.
Preliminary Work and Pilot Studies

A Typology of Labor Interventions

Labor and birth are conceptualized as physiological processes in perfect balance needing only supportive interventions when cues are reassuring. Introduction of interventions that are invasive may produce undesirable side effects proportionate to the invasiveness of the intervention. A typology of labor interventions (Appendix B) was devised to further develop this conceptualization and to provide a conceptual starting-point for this investigation.

A list of all conceivable interventions for labor and birth was developed by the Principal Investigator (PI) and reviewed by content experts including experienced labor and delivery nurses and nurse-midwives. The list was categorized and refined. There are eight categories in the typology ranging from the most noninvasive interventions to deep body invasion. Each category was designed to be exhaustive and mutually exclusive. The decision rules for the progression of the intervention types were based on increasing levels of anatomic and physiologic invasiveness. The typology allowed distinction between interventions that are noninvasive and those that are invasive.
The categories are:

Noninvasive Interventions

Type 1. Interventions that are not physical. The care provider is present but does not touch the parturient.

Types 1 or 2. Positional interventions may be type 1 or 2 depending on the degree on invasiveness. Physical touch invades the parturient's "space" and is a higher level than verbal instructions.

Type 2. The body of the parturient is physically touched by the care provider or an agent of the care provider.

Type 3. Manipulative interventions involving a degree of external manipulation or stretching that are not painful.

Type 4. Internal, physiologic interventions that are invasive but remain in a physiological or normal realm, such as oral food and fluids.

Invasive Interventions

Type 5. Interventions that involve instrumentation or manipulation, often with an instrument, and sometimes causing pain. Such interventions include vaginal exam, artificial rupture of membranes, vacuum extraction, and forceps.

Type 6. Interventions that invade the body in some way but preserve skin integrity. For intrapartum care, these include all manner of systemic drugs, all of which are shared with the fetus.
Type 7. Interventions with skin penetration. Pain is inflicted. Any intravenous, intramuscular, or intraspinal injection is included as well as fetal scalp electrode and episiotomy.

Type 8. Interventions that invade the body anatomically beyond an orifice (deep body invasion). Interventions in this category include intrauterine pressure catheter, amniinfusion, manual removal of the placenta, and uterine exploration.

Pilot Studies

A total of three separate pilot studies were conducted in preparing for this dissertation research. Each of them contributed toward establishing the adequacy of the data source for the aims of the study, developing and refining data collection tools, and refining the method of statistical analysis.

Observation Pilot

For more than a year before the research was initiated, an extensive period of time was spent observing labors and births and informally interviewing care providers. These observed births confirmed that direct observation as a data collection method was not feasible for the entire study sample. The breadth of data that the research observer had access to was more limited than data that would be available later in a chart review, and resources were not available to insure a randomized sample. Furthermore, the presence of the research observer could influence the clinical
management of care providers. This became evident from casual conversation with the attending physicians and nurse-midwives. Chart audit can document the interventions applied when the care provider is not cognizant of observation of their performance. During this first pilot study, field notes were made and analyzed using qualitative methods. These data were used to design quantitative data forms and refine the variables to be studied.

**Intervention Pilot**

To validate that different levels of invasive interventions could be identified by professional care providers, a second pilot study was conducted. Three postpartum nurses and one maternity nursing instructor, all of whom were familiar with the postpartum census, were separately approached and asked the same question: "Would you please identify two patients who had a high number of interventions and two who had a low number of interventions during their labors?" Each nurse had different suggestions. There was agreement by two nurses on two potential subjects. On that day, a total of five patients who were suggested met the inclusion criteria that later were applied for the chart-audited study sample. Data on interventions and intrapartum maternal and fetal responses were abstracted from the intrapartum hospital records of the five. These data are presented in graphic form in Appendix C. The conclusions from this pilot were a) that providers
could distinguish parturients who had a higher number of invasive intrapartum interventions from parturients with a lower number of interventions, and b) parturients with a higher number of invasive intrapartum interventions had more unfavorable responses during labor than parturients with a lower number of interventions. The findings from this pilot study were instrumental in the selection of the outcome variables.

**Chart-Audit Pilot**

The third pilot study of low risk parturients (n = 21) was done using chart audit to refine the data collection instruments, set up the computer program for data analyses, and confirm the estimated sample number and planned analyses. The phrase low risk parturients refers to those women who are admitted to the labor and delivery unit, examined by a professional care provider and found to be healthy with no unresolved antepartal complications. The care provider declares them without risk or low risk and anticipates a normal, spontaneous birth.

A list of deliveries that occurred at MacDonald Hospital for Women (MHW) in November 1992 was requested from the Director of Health Information Services at University Hospitals. From this list, potential subjects were randomly selected, and their records were audited. Of the randomly selected potential subjects, 55% did not meet inclusion criteria due to multiple codes and uncoded conditions from the International Disease Classification,
9th edition (ICD-9) system. In analysis of these data, an important finding was a normal distribution for the total of number of interventions, suggesting that normal distribution could be anticipated in the chart-audited random sample. In this small sample of 21, no cesarean births occurred. According to the MHW Office of Research statistics, the cesarean birth rate was 18% of all deliveries. If the anticipated 18% were realized, there should have been subjects who experienced cesarean birth. Because the sample was limited to low risk parturients, estimation of cesarean births for the study sample was revised from 18 to 20 down to 6 to 9 cesarean births. A working relationship was established with the study supervisor in University Hospitals' Health Information Services Department that carried over into collection of study data.

Hypotheses, Research Question, and Variables

Hypotheses and Research Question

Four null hypotheses and one research question were proposed. The universe sampled was low risk women anticipating an uncomplicated labor. For this research, low risk women are those parturients who were admitted to the labor and delivery unit, examined by a professional care provider and found to be healthy with no unresolved antepartal complications. The care provider declared them without risk or low risk and anticipated a normal,
spontaneous birth. The following null hypotheses and research question were proposed:

Hypothesis 1. The number of different invasive intrapartum interventions and neonates' Apgar scores are not correlated.

Hypothesis 2. The number of different invasive intrapartum interventions and neonates' Hobel morbidity scores are not correlated.

Hypothesis 3. The number of different invasive intrapartum interventions and fetal stress reactivity are not correlated.

Hypothesis 4. The number of different invasive intrapartum interventions for parturients with vaginal births and parturients with cesarean births does not differ.

Research question: Is there a relationship between the number of different invasive intrapartum interventions and physiological distress experienced by parturients during hospitalization for childbirth?

Variables

Independent Variable

The independent variable was the number of different invasive intrapartum interventions (NODI) a subject incurred during the course of low risk labor and birth. Interventions in the context of low risk labor and birth are physical actions or procedures implemented during the course of labor from the time of hospital triage and admission through third stage of labor. For this
research, an intervention that is invasive crosses an anatomical barrier as categorized by the typology of interventions (Appendix B) and may immediately or over time destabilize normal intrapartum or postpartum physiological function in some way. The intervention may cause a) pain or discomfort unrelated to or excessive for labor; b) unphysiologic side effects; and/or c) additional risk to the parturient or fetus.

Outcome variables

Five outcome variables were measured. Two reflected neonatal physiological responses to labor, one reflected fetal response to labor, and two reflected outcomes for the parturient.

1. The Apgar score is a commonly used neonatal assessment measure and was assumed in this research to reflect fetal insult during labor and birth.

2. Morbidity for neonates was measured by the Hobel neonatal risk score, which accounts for 35 factors of morbidity (Hobel, Hyvarinen, Okada, & Oh, 1973). The Apgar and Hobel instruments are in Appendix D.

3. Fetal stress reactivity (FSR) was a construct defined as occurrence of meconium stained amniotic fluid, episodes of variable and/or late fetal heart rate (FHR) decelerations, bradycardia, tachycardia, and changes in FHR variability. The components of FSR were considered to be empirical indicators of fetal stress.
4. For this research, cesarean birth was an outcome variable. Each low risk parturient admitted for delivery had a probability of having an unplanned cesarean birth due to a pathological development.

5. The empirical indicators of physiological distress for parturients were chart notation of signs or symptoms of fever (oral temperature exceeding 37.5 C.), failure of pain control method, dysfunctional labor, and other distress such as itching, nausea, vomiting, maternal exhaustion, hypertension, hypotension, and so forth. The assumption was that if the parturient’s symptoms were charted, they represented a condition distressing enough for her to mention to, or be noticed by, a care provider.

Summary for Chapter One

The literature on the efficacy of the trend toward use of complex technology in low risk parturition is inconclusive. As an initial step in a program of research, the purpose of this research was to investigate the cumulative impact of invasive interventions commonly employed to provide comfort, timeliness, and safety during intrapartum. To do so contributes to a gap in the literature on the association between multiple intrapartum invasive interventions and the outcomes that may ensue, in the context of low risk labor and birth. This research was unique in considering interventions over the entire course of labor and in assuming that the impact is cumulative. The
following chapter contains an in-depth exploration of the literature supporting the organizing framework and hypotheses.
CHAPTER TWO - REVIEW OF LITERATURE

The purpose of this research was to investigate the cumulative impact of the number of different invasive interventions commonly employed to provide comfort, timeliness, and safety during intrapartum. In this literature review, research foundational to the premises of this study was critiqued for documentation of the problem; clarity of purpose; statement of the hypotheses; adequate research design including sampling, data collection, and analysis; and significance of findings. Studies that were supportive but not foundational to this research are cited also. This review explores literature that investigated medical and nonmedical determinants for intervention use during labor and birth and linked interventions to outcomes.

Practice Style

Characteristics that are uniformly distinctive about how an individual clinician or group of clinicians managed the process of labor and birth demonstrate practice style. Practice style is the decision-making response of the caregiver to the perception and interpretation of cues during a caregiving event. The process is covert and is observed externally by the interventions implemented. Practice style implies a consistency over the course of a labor in the multiple decisions, each arising from the previous choice, to use or to not use invasive and complex technology. Practice styles differ in interpretation of the elements of labor and birth. The perceived differences in responses to the
same cues appear to have multiple roots. Observing what care providers do, DeVries (1989) described three practice styles during childbirth that have evolved over time - active, passive, and active passivity.

**Active Style**

The active style, also called interventionist, accompanied the ascendancy of the biomedical model and medicalization of childbirth and prevails in many medical centers. Pregnancy is seen as a pathological condition, birth is viewed as dangerous, and both are in need of medical supervision (Colliere, 1986), maxims still promulgated in schools of western medicine, according to a medical student informant (E. A. Kvale, personal communication, February 17, 1991). The caregiver using this style is quick to intervene and relies on technology to monitor and deliver the parturient. DeVries (1989) commented, "Carefully controlled studies might demonstrate that it is better not to intervene, but to stand idly during a long labour certainly does not look scientific." (p. 155).

**Passive Style**

The earliest described practice style, called passive by DeVries, is the wait-and-see style where the caregiver assumes a passive role using only support, encouragement, and folk wisdom to aid the parturient. DeVries (1989) says this style is prevalent among lay midwives who see themselves as the true noninterventionists. They believe birth is a normal process
requiring little or no outside intervention other than that which supports the physiology of labor.

**Active Passivity**

Active passivity is a style that incorporates elements of both the active and passive styles. In this style, the care provider watches expectantly anticipating a favorable outcome, is slower to intervene when the labor varies from normal, but does not hesitate to employ the most sophisticated technology available once the cues are diagnosed as pathological. For the purposes of this dissertation only two categories will be used: interventionist for the active style and non-interventionist for the passive and active passive styles. This division is based on the philosophical distinctions that underlie the practice styles.

**Philosophical Foundations for Practice Style**

**Schema**

Central to practice style is the philosophical foundation that underpins the beliefs, values, and knowledge of the caregiver (Rhodes, 1988). Psychology literature was searched for theory that supports the notion of set differences in responding to the same stimuli. A schema is a pattern of associations, mental set, or cognitive network expressing past experiences and education, a sum of the individual's knowledge about something. Much of the research on schema deals with some area of individual self-perception
A well developed schema in a particular area guides the perception and processing of incoming data and allows the individual to make relevant judgments quickly. A discipline's traditions, beliefs, and science as well as the individual's personal experiences and beliefs, form a schema or mental set that may drive the caregiver's practice style. While a certain practice style may characterize a discipline distinguishing a nurse-midwifery style from a medical style for example (Baruffi, Strobino, & Paine, 1990), individuals within that discipline also may hold a differing philosophy and practice in a different style (Goyert, Bottoms, Treadwell & Nehra, 1989). Consideration of risk versus benefit of any given intervention finds a dilemma biased by the collective schema of the discipline and the caregiver's expression of that schema in practice style. The concept of schema may explain why caregivers appear to respond with different practice styles to the same caregiving event, in this case, low risk labor management.

Two reports (Cohen & Ebbesen, 1979; Massad, Hubbard, & Newtson, 1979) test the hypothesis that a mental set is present when a schema is activated. That is, individuals see what their schemata prepare them to see. This would confirm that cues are attended to and processed relevant to the perceived potential outcome in mind. Caregivers visualize an outcome in the caregiving process. Some have a schema in which the movement is toward a
goal of health, and others have a set goal as movement away from disaster. Schemata guide the selection and interpretation of incoming information (Fong & Markus, 1982). This increases the support for the idea that caregivers look for cues consistent with their internal schema.

Once set, a schema appears to resist change. Thus, even when practices are demonstrated to be useless, counterproductive, or just not scientific, practitioners may resist organized attempts to change locally accepted customs of practice (Zdeb & Logrillo, 1989) This may be due to the practitioner’s interpretation for the event at hand relative to the practitioner’s schema. A noninterventionist approach would consider interventions such as internal electronic fetal monitoring, routine intravenous therapy, and augmentation for delay in labor inappropriate for a healthy woman with a healthy fetus. For an interventionist, the error would lie in withholding the same interventions considering the risk inherent in any labor. Neither would likely be sympathetic to the other’s schema nor willing to alter their own philosophical commitment.

Schema is part of the socialization process in education for any professional discipline (Richards, 1982), and includes the values, traditions, and beliefs as well as accumulated knowledge of the discipline. Three overlapping disciplines participate in care for low risk childbearing - medicine, nursing, and midwifery (Varney, 1987). Many of the studies in this review
include comparison of physicians and nurse-midwives in clinical management and outcomes of low risk births. Western physicians educated in the paradigm of reductionism follow a schema based on the biomedical model.

**Philosophy of Medicine**

The biomedical model dominates the practice of medicine in much of the world. This model developed from the thinking of Newton, Descartes, John Stuart Mill, and the logical positivists (Ladd, 1979; Pellegrino & Thomasma, 1981). It incorporates the attributes of dualism, mechanism, and reductionism while excluding humanism from science (Engel, 1988). The biomedical model, accepting almost exclusively the germ theory of disease, limits exploration of the linkages between the purely physical realm and all other aspects of the person and the environment. In practice, the biomedical model is disease-oriented and restricts its scope to medical, surgical, and psychiatric conditions that may be treated by drug therapy or surgical procedures to eliminate disease and restore health (Siegler, 1979). Despite these restrictions, the biomedical model still dominates much of academic and clinical medicine and has led to remarkable scientific and technological achievement.

Cassell (1979) argues that though the objective biomedical focus was necessary to sift magic, folk remedies, superstition, and religion from science, the time has come to shift to a focus on the person. New models should wed
techne' and science to value (Ladd, 1979). Though a number of other conceptual medical models have developed as an alternative, the biomedical model remains firmly entrenched in western medicine, hospitals, and to a lesser degree, nursing. Two currently practiced variants of a biomedical interventionist style are described in recent medical literature. The first, "criterion of potential benefit", allows the caregiver latitude to try a procedure or treatment if it might have benefit whether or not there is any scientific rationale to support the intervention (Eddy & Billings, 1988). The second called the "maximin" approach is synonymous with the interventionist style of practice. Described by Brody and Thompson (1981), the caregiver using the maximin approach imagines the worst possible disaster and then intervenes a priori to rescue the best possible outcome.

Though caring is mentioned as an aspect of medicine (Guttentag, 1979; Pellegrino & Thomasma, 1981), it is not a dominant theme. This may be because it is an implicit universal maxim or, like other human values, is represented in rituals and symbols of the profession (Cassell, 1979). Regardless, the concept of care is not represented strongly in the dominant medical models (Roper & Hackbarth, 1988). In fact, the essence of medicine as interpreted by any conceptual medical model remains curing. According to Pellegrino & Thomasma (1981), "The best starting point for medicine is the possibility of a cure in the real world of practice" (p. 53). They define medicine
as that body of knowledge that appropriately analyzes corporeal symptoms and applies remedies to cure them. What distinguishes medicine from other helping professions is the cure, a physical and organic restoration of health.

**Philosophy of Nursing**

While many physicians and medical philosophers consider curing and healing to be synonyms, Quinn (1989) takes issue with such lack of distinction. She claims that curing "refers to the elimination of the signs and symptoms of disease—no more and no less" (p. 553). Healing is the restoration of wholeness. Historically, nursing involved those activities that assured comfort, nurturance, and succorance for others, sick or well (Kalisch & Kalisch, 1986). Because from the beginning of culture nursing included caring for others, it became an activity of primarily women (Colliere, 1986). Nursing was not a commodity that was purchased or publicly marketed. It took place in the home and with the family. Healing has been and can be an outcome of nursing, but cure is neither the focus nor goal.

The relevance of schemata for professionals has been considered in how nurses make clinical inferences (Abraham, 1986). Through professional maturation, nurses organize diagnostic indices of normalcy which are interwoven with personal values of ideology, philosophy, ethics, religion and culture. An ongoing study (M. Kerr, personal communication, February 1, 1991) is examining the relevance of schema to professional nurse
specialization. Preliminary findings suggest that a specialization focus fosters feelings of competence and improved efficiency in processing information relative to the specialty. This explains in part Benner's (1984) finding that "a committed stance provides a sensitivity to cues that allows persons to search for solutions and even makes it possible to recognize a solution when they are not directly looking for it" (p. 215).

Describing those characteristics that separate nursing from all other disciplines has been a dilemma that prevented society from recognizing or valuing the discipline (Friedman, 1990). In an effort to identify the domain of interest to nursing, Fawcett (1984) described a nursing metaparadigm which includes the components of persons, environment, health, and nursing. Meleis (1985) terms these components domain concepts and replaces nursing with three other concepts: transitions, nurse-patient interactions, and nursing therapeutics. With the possible exception of nursing therapeutics, all other domains are shared with other disciplines - an observation not lost on the practitioners of medicine (Friedman, 1990).

Philosophically, Nightingale's perception of the role of the nurse reflected the model of Greek medicine. Nightingale emphasized the environmental impact on health. She believed nature healed and the nurse facilitated healing by putting "the patient in the best condition for nature to act upon" (Nightingale, 1910, p. 133; Quinn, 1989).
Benner (1990) interprets care as one of two paradigms. The control paradigm is technology centered and associated with objectivity, mechanism, and masculinity. It is described as "... a crisis: an accident on the way to happening" (Benner, 1990, p. 6). The mind is in control, and the body follows. This description is characteristic of the biomedical model in the present western health care system. The caring paradigm is associated with femininity, caring, and connection; prevention is a natural outcome of this paradigm. The caring paradigm precedes and carries the control paradigm, providing the foundation, guidance, and ethics for use of control. Benner (1990) implies a need for harmony or balance between the two paradigms. In the present nursing-medical-institutional culture, the balance has been lost as an outcome of a Cartesian entrancement.

Certified nurse-midwives give allegiance to and practice in a noninterventionist style (Andrews, 1983; Varney, 1987). Evidence in the literature supports the proposition that certified nurse-midwives (CNMs) have impressively low rates of morbidity and mortality when caring for women during the antepartum, intrapartum, and postpartum periods. The uniqueness of midwifery within nursing is its grounding on the health and the normalcy of the individual. For this reason, nurse-midwifery expresses in a pure form the essence of nursing in caring for the person, not the pathology, and in emphasizing the importance of the environment for childbirth as the medium
for health of the mother-fetus/neonate dyad. Normalcy is one of the strongest concept domains for nurse-midwives. That pregnancy is a normal, physiological process and the body can be trusted to adjust to this dynamic state is articulated explicitly. Such is the ground upon which nurse-midwifery philosophy and practice is founded (Shoemaker, 1959). According to Sharp (1988), "... nurse-midwifery is unique in its emphasis on the promotion of normalcy that cuts across phases in the woman's life cycle" (p. 1).

Linking Philosophy to Practice

Much recent research has been devoted to comparing the differences between physicians and advanced nurse practitioners, sometimes by health policy analysts eager to cut costs in health care delivery. The research has focused both on intervention use and outcomes. In a retrospective evaluation of the intrapartum outcomes of 452 low risk women, Kaufman and McDonald (1988) found a difference in the style of practice between physicians and nurse-midwives. The study specifically focused on comparing the outcomes of a group of 79 women managed by nurse-midwives with a second group (n = 373) managed by physicians. The midwifery group included those parturients who required medical intervention at some point in the intrapartum course of events. While the investigators found significant reductions in amniotomy, epidural block, and episiotomy, they found significant increases in the use of transcutaneous nerve stimulation for pain control and in perineal
lacerations. The investigators acknowledged this retrospective chart audit was hampered by missing data and inadequate resources.

A second Canadian study (Buhler, Glick, & Sheps, 1988) compared outcomes of low risk parturients whose births were managed either by nurse-midwives or family physicians. Instruments included a questionnaire as well as chart review to assess monitoring of patient progress, clinical judgment, decision-making, and recognition of cues. The findings noted these differences: nurse-midwife patients (a) sought care earlier; (b) made more prenatal visits; (c) were more likely to enter labor spontaneously; (d) were more likely to have a primary laceration; and (e) were less likely to have an episiotomy.

Nurse-midwives have felt constrained to document the safety and advantages of their care in order to find acceptance in the communities of consumers as well as medical colleagues. In a meta-analysis of nurse-midwifery research, Thompson (1986) found such differences between physician and certified nurse-midwife caregivers. Following an exhaustive search of the literature and a carefully described selection process, a final sample of 50 published studies from 1929 to 1984 was critically reviewed for outcomes, process, and structure of nurse-midwifery care. There were 39 observational and 11 experimental designs represented. Median sample size
was 481 with a range of 13 to 10,000. Criteria used to critique the studies are consistent with the standards of meta-analysis.

Thompson thoroughly discussed inherent conceptual and methodological concerns, use of instruments, and data analysis of the studies. Considered as an group, the outcomes generally included a reduction in maternal and infant mortality and morbidity regardless of setting and in both low and moderate risk populations. Specifically, neonatal weights were consistently higher in nurse-midwife samples, prematurity rates lower, and Apgar scores equal or higher. Compared with physician samples, nurse-midwives had a higher percentage of spontaneous vaginal deliveries and lower forceps and cesarean birth rates. The number of prenatal visits was higher, women registered earlier for care, and fewer women had preeclampsia. Some studies reported higher client satisfaction with nurse-midwifery care.

In comparing nurse-midwifery care with physician care, one questions whether the standards of care are truly comparable. Thompson calls for standardizing quality of care for healthy pregnancies regardless of the educational preparation and disciplinary identification of the caregiver. While these studies documented safety, careful consideration of the conceptual elements of midwifery care is lacking.
Summary of Philosophy

The descriptions in the literature of the philosophical underpinnings for the interventions used by care providers in low risk labor and birth appear to be variations on a continuum between noninterventionist and interventionist practice styles. A style that anticipates the pathological potential of pregnancy and birth and intervenes invasively to prevent disaster might be termed interventionist. A noninterventionist style places trust in female physiology to function within the boundaries of normalcy, anticipates a favorable outcome, and uses interventions that do not interrupt the physiological unfolding of pregnancy and birth. Both styles freely use interventions to provide comfort and timeliness to birth. The term noninterventionist refers to a reluctance to intervene in a manner contrary to the physiological norms and the natural developmental process of labor and birth. Nurse-midwives ground their practice on the concept of normalcy, which is expressed in a noninterventionist practice style. Because philosophically the mandate for medicine is to cure, an interventionist style of management, based on the projection of potential pathology and the need to prevent (cure) that potential, dominates for many physicians.
Linking Interventions to Outcomes

Nonmedical Determinants of Practice Style

Lomas and Enkin (1989) analyzed the findings of several studies on rates of instrumental deliveries. They concluded that the wide variations described probably were not related to the population served or available resources.

Care Provider's Philosophy

The findings of several studies linking patterns of obstetric procedure use to obstetric outcomes suggest caregiver philosophy may influence practice style (Baruffi, Dellinger, Strobino, Rudolph, Timmons, & Ross, 1984a; Baruffi et al., 1984b; Eakins, O'Reilly, May. & Hopkins. 1989; Rooks, Weatherby, Ernst, Stapleton, & Rosenfield, 1989; Strobino, Baruffi, Dellinger, & Ross, 1988). Some researchers have observed differences between individual caregivers (Goyert et al., 1989), specifically in the use or nonuse of invasive procedures when encountering intervention choices during labor and birth. Given the same context of low risk labor and birth, groups of caregivers within some institutional settings practice differently according to the professional discipline in which they were educated (Baruffi, Strobino, & Paine, 1990; Buhler, Glick, & Sheps, 1988; Kaufman & McDonald, 1988; Levy, Wilkinson, & Marine, 1971; Mayes, Oakley, Wranesh, Springer, Krumlauf, & Crosby, 1987; Runnerstrom, 1967).
Some accounts in the literature suggest that pregnant women who are managed by certified nurse-midwives have better maternal weight gain (Doyle & Widhalm, 1979), a higher hematocrit (Doyle & Widhalm, 1979), better compliance in terms of early initiation of and number of antepartal visits (Slone, Wetherbee, Caly, Christensen, Meglen, & Thiede, 1976; Levy, Wilkinson, & Marine, 1971), lower prematurity rates (Murdaugh, 1976; Levy et al., 1971), lower infant mortality rates (Meglen, 1972; Levy et al., 1971), less use of analgesia, anesthesia, and continuous electronic fetal monitoring, (Mayes et al., 1987) and lower cesarean birth rates (Baruffi, Strobino, & Paine, 1990) than women managed by physicians. Some of the above citations are based on anecdotal evidence and descriptive studies subject to bias. Others are from more carefully designed and controlled research. None can be accepted as causal in terms of either interventions or outcomes, but merely as inferring possible linkage. This evidence suggests that a noninterventionist practice style may impact parturient and neonate outcomes favorably.

However, evidence of the continuing strength of the interventionist style is an increase in the number of invasive procedures reported during labor and delivery in the United States from 1980 to 1987 (Kozak, 1989). Undoubtedly some of this increase is due to better reporting after 1983 following the implementation of diagnosis related groups and prospective payment plans.
Using the data base from the National Hospital Discharge Survey, Kozak (1989) discovered that cesarean birth rose from a rate of 16.5 per 100 deliveries in 1980 to 24.4 in 1987. Artificial rupture of membranes rose from 3.2 to 12.2 in the same period of time. Also rising during this time was electronic fetal monitoring, medical induction of labor, diagnostic ultrasound, and vacuum extraction. Procedures which declined in use were episiotomy (though laceration repairs rose) and forceps deliveries. Kozak concluded that characteristics of obstetric care in the United States had clearly changed in the 1980s toward increased use of technology and surgical interventions. Mayes et al. (1987) found that physicians used significantly more complex technology such as intravenous therapy, pitocin, artificial rupture of membranes, analgesia, anesthesia, episiotomy, and birth in the delivery room as opposed to a labor/birthing room, than nurse-midwives. Their retrospective chart audit of 29 matched pairs with low statistical power has not been replicated.

**Institutional Philosophy**

A series of publications (Baruffi, Strobino, & Paine, 1990; Baruffi, Dellinger, Strobino, Rudolph, Timmons, & Ross, 1984a; Baruffi, Dellinger, Strobino, Rudolph, Timmons, & Ross, 1984b; Strobino, Baruffi, Dellinger, & Ross, 1988) report research that examined the process of care at two institutions by comparing the use of selected obstetrical procedures at a birth
center and a tertiary care center. The primary caregivers at the birth center were certified nurse-midwives with obstetrical consultation available on site. The tertiary care center caregivers were obstetrical residents and attending physicians. Initially the purposes of the audit were to compare the safety of an alternative birth center with an established tertiary care center (Baruffi et al., 1984a), to study the relationship between the use of obstetrical procedures and the distribution of risk of women within and between the two institutions (Baruffi et al., 1984b), and to verify the use of the Hobel neonatal risk scoring system as a measure of neonatal morbidity (Strobino & Baruffi, 1984).

A stratified random sample of 796 women was drawn retrospectively from birth center medical records. No effort was made to select low risk clients other than those that would usually be included in nurse-midwifery management in the birth center. Since physician consultation was available on site, labors that culminated in instrumental delivery were included. A control sample of 804 women (the difference in numbers between the two samples was not explained) from the tertiary care center, a university teaching hospital, was matched using 127 different strata combinations including age, education, race, parity, and obstetric history. Matched pairs is a strong sampling strategy and controls for an array of socioeconomic variables. Multivariate analyses were appropriate for these data in which multiple
outcomes were compared. The researchers took care to explain methodology and analyses in the publications though the detail for each varied somewhat.

The findings from this large data base were first published in three simultaneous articles in the fall of 1984 (Baruffi et al., 1984a; Baruffi et al., 1984b; Strobino & Baruffi, 1984). The findings indicated that not only was care at the birth center safe, but in some instances had better outcomes than those at the tertiary care center, with the greatest difference found among low risk women (Baruffi et al., 1984a; Baruffi et al., 1990). The tertiary care center had significantly higher use of obstetrical procedures and drugs such as x-ray, oxytocin, anesthesia, episiotomy, electronic fetal monitoring, low outlet forceps, and cesarean birth with this population of low risk women (Strobino et al, 1988). The rate of vaginal delivery was 54% at the tertiary care center and 83% at the birth center. There was a higher rate of analgesia use at the birth center - 24.7% compared to 7.1% (Baruffi et al., 1984b).

These findings led to further analysis of the data base in an effort to explore the relationship between the use of obstetrical procedures and outcomes (Strobino et al., 1988). The authors hypothesized that the difference in philosophy at the institutions might influence the difference in use of obstetrical procedures. This secondary analysis confirmed the earlier findings of statistically significant differences in use of procedures and in outcomes. In speculating that philosophical differences between the
institutions played a part in the outcomes, the authors noted the "special personal attention given to women at BMC [the birth center] by nurse midwives also may have played some role in the institutional differences" (Strobino et al., 1988, p. 345). Subsequently this hypothesis was more directly addressed by exploring the reasons for institutional differences in the cesarean birth rate and reasons given for requiring a cesarean delivery (Baruffi et al., 1990).

Over this series of publications, the authors generated several alternative hypotheses for the differences between the two institutions. Though the women were matched for intrapartum risk using a Hobel score and the scores were the same for both groups, there could have been a difference in the distribution of risk between the two institutions, though this was thought unlikely. Also there may have been a measure of self selection for women choosing nurse-midwifery care. In the institution with the lower rate of cesarean birth, labors were managed solely by certified nurse-midwives. Of these alternatives, the authors concluded the critical difference in care practices most likely stemmed from different philosophies espoused by the caregivers at the two institutions - resident and attending physicians at the tertiary care center and nurse-midwives and attending physicians at the birth center. They also conceded that some commonly accepted assumptions about obstetrical care needed to be reexamined, such as the assumption that
tertiary care is the "best" for all women and that increased use of obstetrical procedures will lead to better outcomes.

The conclusions of the research must be regarded with a number of limitations in mind. This was not only a retrospective study, but the data base was from 1977-1978 when the overall cesarean birth rate was 12%. Rates and possibly standards of care for both types of providers have changed in the intervening years. Furthermore, while the authors credit nurse-midwifery philosophy for the lower cesarean rate, there was no way to account for other factors such as the influence of the consulting physicians or the rest of the staff at the birth center.

A prospective, descriptive study of 17,856 women nationwide using the services of a birth center reported striking differences in the care provided compared to hospital care (Rooks, Weatherby, & Ernst, 1992a; Rooks, Weatherby, & Ernst, 1992b; Rooks, Weatherby, & Ernst, 1992c). In the birth centers, fewer invasive interventions occurred than in hospitals as determined by a comparison study of 2,256 hospital subjects (Fullerton & Severino, 1992). The birth centers showed less use of drugs that are central nervous system depressants, less anesthesia, less continuous electronic fetal monitoring, fewer inductions or augmentations of labor, fewer intravenous infusions, amniotomies, episiotomies, and fewer vaginal exams. Restriction of oral intake was less likely to be practiced and the women, unencumbered by
equipment, were able to take more showers or baths as comfort interventions. First-time birth center mothers experienced longer labors and encountered many kinds of noninvasive interventions used frequently. In assessing outcomes, the cesarean birth rate for the birth center sample was 4.4% (compared to 9.5% in the hospital sample and 24.4% nationally). Birth center subjects experienced an assisted delivery (forceps or vacuum assistance) 0.5% of the time compared to 3.1% of the hospital subjects. Of 11,474 fetuses, 74.5% were without indication of any fetal distress. For Apgar scores in the birth centers, 89.1% of the neonates had scores of 7-10 at one minute, and 95.7% at five minutes. In the hospital sample, 95% had an Apgar of 7-10 at five minutes (one minute scores were not published). In both studies, the universe sampled was low risk women, and the care providers were predominantly nurse-midwives.

**Active Management of Labor**

Proponents of a highly publicized package of interventions called "active management of labor" claim favorable outcomes and low intervention rates (Boylan, 1989). However, the description of the protocol is interventionist in nature. In active management of labor, the induction or augmentation rate for primigravidas reaches 40%, and rupture of membranes upon diagnosis of labor is routine (McDonald, 1990). Active management of labor means "the active involvement of physicians in the supervision of labor"
(Boylan, 1989, p. 114). The goal of active management of labor is to deliver all parturients by the end of 12 total hours of labor. Emotional ideation provided the rationale for this protocol with "... concern at the plight of women who were in labor for 36 to 48 hours, dehydrated, confused, and narcotized, and who experienced traumatic delivery at the end of a long period of time. Doctors stood back with the midwives more or less helpless in the face of this never-ending ordeal" (Boylan, 1989, p. 114). Because diagnosis of when labor actually begins was crucial in producing labors that do not exceed 12 hours, this was the most critical medical (not midwifery) responsibility. The standard for this is the presence of two accepted indicators of labor. The indicators are regular painful contractions, bloody show, effacement and dilation of the cervix (McDonald, 1990). McDonald emphasized that a crucial element in producing labors that progress with the maximum possible comfort is the one-to-one presence of a caring other, usually a midwife.

In active management of labor, as soon as the physician declares the commencement of labor, amniotic membranes are ruptured routinely to assess the quantity and color of the amniotic fluid (Boylan, 1989). If dilation in primiparas does not proceed at the rate of one centimeter per hour from diagnosis of labor, oxytocin augmentation is introduced. While there is some flexibility to the length of labor allowed, cesarean delivery is a routine
response if the patient is undelivered at the end of 12 hours. The rate of cesarean birth with active management of labor ranged between 4.2% and 6% from 1982 - 1984 (Boylan, 1989). During the same period time, the cesarean birth rate at Parkland Hospital in Dallas was 18%. The use of epidural anesthesia in Dublin was 15% compared to 66% at another U.S. hospital.

While these figures are cited as indication of the low rate of intervention accompanying active management of labor, they also may reflect regional standards of medical practice. Furthermore, the standards defining a low intervention rate by the proponents of active management differ from those of others (DeVries, 1989) and represent an interventionist style of practice as defined in this research. The expressed motivation for active management of labor and outcome standard of shorter labors is not a scientifically generated standard. The proponents have not measured the quality of the labor and birth for the parturient and the fetus, other than the length of labor.

After the concept of active management of labor was introduced in Houston, the average duration of labor was reduced from 12.8 hours to 7.7 hours (Boylan, 1989). Spontaneous vaginal deliveries rose from 55% to 74%; oxytocin infusion fell from 50% to 41%; the cesarean birth rate was lowered from 32% to 10%; and the diagnosis of fetal distress dropped from 4.6% to 1.9%. Epidural anesthesia remained at 66%. These findings, which seem to
support the advantages of active management of labor, could be due to
confounding variables which are not acknowledged in the research reports.
There is no description of the preparation medical and nursing staff received
for implementation for the protocol of active management. An enhanced team
spirit to improve outcome might have been engendered for any management
change. In other words, an interaction between intervention and personnel is
a threat to validity. Likewise, a change in other standards of practice, not the
package of interventions called active management of labor, could be
responsible for the change in intervention rates. For example, McDonald
(1990) identified one to one nursing (midwifery) presence as the single most
important item in the active management of labor.

Beginning from the original premises on which the protocol is based
(women in prolonged labor who are "dehydrated, confused, and narcotized"),
one can only wonder if any other solutions were considered to remedy such
experiences. The policy on hydration during labor was not described. This
could vary from food and liquid as desired to total intake restriction with
intravenous infusions. Nourishment of some kind is necessary to prevent
dehydration or exhaustion. Heavy use of narcotics could have produced the
women described as confused. Nonpharmacologic alternatives, such as the
constant attendance of the midwives, may have altered the need for narcotic
use and thus rendered the women lucid under the active management
protocol. The standards for diagnosis of labor before implementing the protocol for active management were not described nor were the standards for amniotomy. The rate of cord prolapse was not shared; iatrogenic cord prolapse accompanies amniotomy on occasion. The lowering of average duration of labor in Houston was cited as evidence of the efficacy of active management of labor. However, evidence is lacking that reducing the average length of labor is advantageous for mothers and babies. In implementing the active management protocol, there may have been systematic bias due to a Hawthorne effect in the reporting of outcomes by the staff. In this respect, a retrospective study might yield more reliable data.

Most importantly, the proponents emphasize that this style is a package protocol. No one component may be expected to succeed in isolation (McDonald, 1989). Yet the proponents of this style acknowledge the most crucial component is the continual presence of a caring other. This may the singular effective component. Kennel, Klaus, McGrath, Robertson, and Hinkley (1991) demonstrate that a supportive presence during labor and birth enabled lowered use of complex technology (cesarean birth rate of 8% versus 18% in a control group; epidural use 7.8% v. 55.3% in a control). This is not an isolated finding. These researchers and others consistently document "presence" as an intervention that appears to reduce need for invasive interventions and subsequent morbidity (Hodnett, & Osborn, 1989; Lehrman,
1988; Sosa, Kennel, Klaus, Robertson, & Urrutia, 1980). While active management of labor has a place in obstetric care, the evidence that it is the best way for all women to labor is not convincing. Even though they may not acknowledge the package of options called active management of labor, these same standards and interventions are prevalent in American hospitals at the current time.

**Cumulative Interventions**

There is a relative plethora of literature on specific intrapartum interventions, on "packages" of interventions to manage labor, and on how best to manage specific aspects or problems of labor. No studies were found in the published literature that link the cumulative impact of invasive intrapartum technology to the outcomes experienced by the parturient and neonate, or on how the selection of the initial invasive intervention leads to the cascade of interventions, if it does. One unpublished study however has been reported. Morris, Nelson-Becker, Bishop, & Chambers (1993) conducted a retrospective, secondary analysis from the Nurse-Midwifery Clinical Data Set (Greener, 1991). In addition to exploring relationships between procedures used in labor and delivery and parturient outcomes, the group compared nurse-midwifery practice with physician practice, compared several types of delivery settings, and documented the level of intervention used by care providers in managing labor and birth. Their purposive convenience sample
(n = 246) was a low risk subset of subjects from the data set (n = 659) reported by Greener (1991). Delivery sites included hospitals, freestanding birth centers, and home births. Ten common interventions were identified for the study - restriction of oral intake, labor stimulation, fetal monitoring, uterine monitoring, medication in the first stage of labor, anesthesia in the second stage of labor, labor position, delivery position, episiotomy, and type of delivery.

Morris et al. (1993) built an intervention index for each intervention using a process of consensus of experts who identified levels of the intervention and ranked the levels. At the point the intervention was determined by the group of experts to be intrusive, a cut-off point was identified which dichotomized the levels into presence or absence of the intervention. The index was computed by counting the presence of the intervention across the ten interventions and totalling the number of interventions per woman. Nonparametric analyses were used to make comparisons by computing the average rank for each intervention relative to provider and place of birth.

The model number of interventions was 1; the mean was 3.5 per woman. The number of interventions used was unrelated to any risk factor a woman manifested. Differences in number and type of interventions were significant (significance criterion not reported) across settings, but not by
provider. More interventions occurred in hospitals and in-hospital birth centers than all other settings. Care providers in hospitals were more likely to restrict oral intake, use continuous electronic fetal monitoring, and use the traditional lithotomy position for delivery. Each of these also were findings in Fullerton and Severino's (1992) descriptive study of hospital deliveries. In comparing the practices of nurse-midwives with physicians, Morris et al. concluded that nurse-midwives and physicians in hospital settings practice in a similar manner.

Summary of Practice Style and Outcome Linkages

These studies link interventions during labor and birth with outcomes and suggest caregivers, individually and by group, may differ in values and beliefs about what good quality care is. The findings of several studies linking patterns of obstetric procedure use to obstetric outcomes suggested caregiver philosophy may influence practice style (Baruffi, Dellinger, Strobino, Rudolph, Timmons, & Ross, 1984a; Baruffi et al., 1984b; Eakins, O'Reilly, May, & Hopkins, 1989; Rooks, Weatherby, Ernst, Stapleton, & Rosenfield, 1989; Strobino, Baruffi, Dellinger, & Ross, 1988). Some researchers within institutional settings noted that, given the same context of low risk labor and birth, groups of caregivers practice differently according to the professional discipline in which they were educated (Baruffi, Strobino, & Paine, 1990; Buhler, Glick, & Sheps, 1988; Kaufman & McDonald, 1988; Levy, Wilkinson, &
Marine, 1971; Runnerstrom, 1967). These studies imply that a noninterventionist style yields favorable outcomes.

Others have observed differences between individual physicians (Goyert et al., 1989), specifically in the use or nonuse of invasive procedures when encountering intervention choices during labor and birth. The implication is that for some clinicians, personal philosophy underlying practice style may transcend disciplinary schema. The findings from the protocol of active management of labor report favorable outcomes with a relatively interventionist style of clinical management (McDonald, 1990).

Each of these studies demonstrates that the interventions that define individual or disciplinary practice style also impact outcomes. They link interventions during labor and birth with outcomes and suggest caregivers, both individual and group, may differ in values and beliefs about what good quality care is. These values and beliefs are manifested in a care provider's practice style.

The Gap in the Literature

Some researchers have studied the efficacy of specific interventions and packages of interventions. Others have searched for nonmedical determinants for intervention use. Nurse-midwives have contrasted their outcomes with those of physicians with the purpose of documenting their practice as safe and in accordance with the socially accepted standard of
medical practice. Clinicians and academics have alluded to unfavorable outcomes from a cascade of interventions precipitated by use of invasive technology. Researchers document a rise in the use of complex technology without a concomitant improvement in morbidity or quality of life. Both adherents of noninterventionist and interventionist styles of practice claim favorable outcomes. However, the outcomes examined were usually diagnosable pathology. None have examined the more subtle signs of a compromised quality of the birth process, such as the stress or distress of the fetus or the parturient. None have studied the outcomes when invasive intervention after invasive intervention is introduced into the management of a low risk parturient. This appears to be the gap in the literature in the study of intrapartum interventions.

Summary of Chapter Two

Practice styles for low risk labor and birth can be dichotomized into an interventionist (active) style and a noninterventionist style. The active style appears to be descriptive of a practice that flows from the medical raison d'être - to cure. To be functional, that is to cure, there must be something that needs curing. A pathology must be found; hence, pregnancy is a pathological state. Birth is a perilous journey for "dehydrated, confused, and narcotized" women shadowed by the specter of death. The caregiver steps in to deliver the woman from this misery, to cure her. Active management of labor as
practiced in Ireland and the United States provides an exemplar of this philosophical paradigm.

The noninterventionist caregiver watches the labor cognitive of reassuring cues of normal progress. Interventions support the physiological unfolding of the birth process and intervene correctively only when cues are alarming. This style is grounded philosophically on the normalcy of female physiology and the birth process.

Practitioner style is set schematically through education and experience and resists change. Evidence from the scientific literature suggests that many accepted and applied interventions are not helpful, and some may be downright harmful. While many studies have considered single interventions and packages of interventions, no published work has studied the cumulative impact of invasive technology in the context of low risk labor and birth. This dissertation is unique in considering selected invasive interventions over the course of hospitalization for labor and birth in relationship to the outcomes of the parturients, fetuses, and neonates.
CHAPTER 3 - METHOD

Research Design

The purpose of this research was to investigate the cumulative impact of the number of different invasive interventions commonly employed to provide comfort, timeliness, and safety during low risk labor and birth. Two methods of data collection were employed. A retrospective chart audit captured the detail of data required to adequately test the hypotheses for 130 low risk subjects. Observation was used as a data collection method for a group of 6 subjects, a validation sample with the more limited purpose of validating chart data and exploring the environment of labor and delivery at MacDonald Hospital for Women (MHW) to explain any unusual findings the data may reveal.

The concept of a cascade of interventions provided a base for the hypotheses of this research. Table 1 brings together the foundational premises underlying the hypotheses, the data variables that capture the evidence for the hypothesis, and the method of measuring the concepts for this research. The table follows the logical order of a cascade of interventions and identifies the corresponding independent variable, hypothesis, or research question.
Table 1. Premises and Corresponding Hypotheses (*in italics*), Variables, and Measurement.

<table>
<thead>
<tr>
<th>Premises and Hypotheses</th>
<th>Variables</th>
<th>Measurement</th>
</tr>
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<tbody>
<tr>
<td>Invasive intrapartum interventions disturb the balance of intrapartum maternal and fetal physiology. <em>Independent variable: number of different invasive intrapartum interventions (NODI).</em></td>
<td>Uterine exploration, episiotomy, episiotomy or laceration repair, third stage oxytocin, barbiturates, other drugs for sedation, intravenous line or heparin lock, epidural anesthesia, lidocaine anesthetic, drug to treat hypotension, catheterizations, cervical manipulation, amniotomy, vacuum extraction, manual removal of the placenta, internal fetal monitoring, intrauterine pressure catheter, vaginal exams, fetal scalp blood sample, fetal scalp stimulation, oxytocin augmentation of labor, tocolytic drug, narcotic analgesia, pudendal block anesthesia, local infiltration anesthesia, oxygen, forceps, amnioinfusion.</td>
<td>Sum of NODI variables that occur during labor and birth.</td>
</tr>
<tr>
<td>Physiological derangement of the parturient destabilizes the physiology of the fetus. <em>Hypothesis 3: NODI and fetal stress reactivity (FSR) are not correlated.</em></td>
<td>Meconium stained amniotic fluid, variable and late fetal heart rate decelerations, tachycardia, bradycardia, diminished or absent beat-to-beat fetal heart rate variability.</td>
<td>Construct of fetal stress reactivity = sum of variables.</td>
</tr>
<tr>
<td>At birth, the neonate’s responses demonstrate the degree of physiological insult to the fetus. <em>Hypothesis 1: NODI and neonates’ Apgar scores are not correlated.</em></td>
<td>One-minute Apgar score.</td>
<td>One-minute Apgar scale.</td>
</tr>
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<table>
<thead>
<tr>
<th>Premises and hypotheses</th>
<th>Variables</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A distressed fetus demonstrates neonatal morbidity. <strong>Hypothesis 2:</strong> NODI and neonates' Hobel scores are not correlated.</td>
<td>Weighted Hobel score.</td>
<td>Hobel neonatal morbidity scale.</td>
</tr>
<tr>
<td>A &quot;cascade&quot; of invasive intrapartum interventions culminates in cesarean birth. <strong>Hypothesis 4: NODI for parturients with cesarean births and parturients with vaginal births does not differ.</strong></td>
<td>Cesarean birth.</td>
<td>Cesarean birth occurs.</td>
</tr>
</tbody>
</table>

**Sample**

**Sample and Size**

The population for this research was limited to low risk parturients and their respective neonates who received intrapartum care at MacDonald Hospital for Women (MHW), University Hospitals of Cleveland. Interventions to prevent or treat pathology are made when the care provider perceives potential pathology. While a number of methods documented in the literature are used to determine intrapartum risk (Kelly, Acheson, & Zyzanski, 1988), this research was designed to reflect the care provider's decisions about the anticipated course of labor and interventions appropriate for the parturient and environment. Therefore, the term low risk parturients in this research referred to those women who are admitted to the labor and delivery
unit, examined by a professional care provider and found to be healthy with no unresolved antepartal complications. The care provider declared them without risk or low risk and anticipated a normal, spontaneous birth.

Two separate samples were selected, a chart-audited random sample of 130 and an validation sample of 6. The sample for the chart-audited group of subjects and the validation sample of observed subjects were selected differently. The sampling frame from which a random sample of 130 parturient women was drawn was the University Hospitals of Cleveland computer data bank of over 3,000 deliveries during the time period from January 1, 1993 to September 30, 1993. This was the most current population retrievable from the University Hospital’s data bank. The validation sample of 6 subjects was a convenience sample selected between December 1993 and March 1994.

The size of the sample was dependent on the number of variables being tested and the statistical test being used. For this research, a sample size of 130 provides sufficient power. Generally accepted statistical conventions were used; the significance criterion and power were 0.05 and 0.80 respectively. Estimation of sample size was computed assuming a moderate effect size, that is, a 20-25% difference in rates between groups or a one-half standard deviation difference in means.
Setting

Limiting the sample to a single institution enhanced a standard of uniformity of information that appears on the hospital record. Uniformity is a necessary quality for a productive chart review (Donabedian, 1968). The strengths in using this population in addition to uniformity are accessibility and the broad random ethnic and socioeconomic mix representative of this Midwest metropolitan community. The racial/ethnic mix of patients served reflected that of the city. As of 1990, the city metropolitan area has 49% white residents, 47% black residents, and 4% other; Hispanics of any race comprise 5% of the total population. Outside the city limits in the seven county metropolitan area, the proportion of white to black is 5:1.

MacDonald Hospital for Women has ample clientele, registering over 4,000 births per year. According to MHW's Office of Research, 65 - 70% of the births are classified as low risk. The cesarean birth rate has dropped in the last two years from 25% to 18%. In 1991, there were 1,181 black intrapartum patients, 1,040 white patients, and 1,840 other, indicating an even split ethnically between African Americans and European Americans. The large number recorded as other probably represents missing data. The ethnic and racial mix included both private and public patients and accurately reflected the population diversity in the metropolitan area. No breakdown by
income was available from the 1990 census but high, medium, and low income women used this facility.

Personnel employed by the hospital include registered nurses with varying levels of education. The attending staff includes obstetricians, family practitioners, and certified nurse-midwives; the house staff is made up of resident obstetricians, family practitioners, certified nurse-midwives and anesthesiologists. Nursing, nurse-midwifery, and medical students are sometimes present at births.

**Human Subjects**

While ethnicity, age, and economic status were abstracted from the hospital record, no attempt was made to exclude any low risk group from this study. Random selection of subjects insured that each potential subject in the population had an equal chance of being selected and retained if they met inclusion criteria. There were no known risks to subjects, their families, or hospital staff.

Measures taken to insure confidentiality included no use of names on research files, identification only by hospital record numbers and codes, and restricted access to data collection forms and the interface between codes and hospital record numbers. All events that occurred during the entire clinical process were considered confidential and were not discussed beyond those issues directly pertinent to the research and with appropriate
personnel. A master list of subjects' names, hospital record numbers, neonates' names and numbers, and codes were kept in the locked office of the PI. Care was taken to return all discarded identifying material to the hospital records department for appropriate disposal. The PI kept all forms and computer disks in a secure location, with restricted access.

The plans for this research and criteria for human subjects was approved by the Institutional Review Boards for both Case Western Reserve University and University Hospitals. No informed consent procedure was required for chart audited subjects. For the validation sample of 6, a researcher was physically present during labor and birth to observe the parturient and fetal response to the interventions used. For this group, the professional care providers as well as the parturients received an explanation of the research, had an opportunity to ask questions, and could refuse the research observer access for data collection. All participants, subjects, and care providers were informed as to the purpose of the research and that the PI was a doctoral candidate at Frances Payne Bolton School of Nursing. The letter of informed consent and Institutional Review Boards' letters of approval are in Appendix E.

Criteria for Admission of Subjects to Study

Criteria for admission of subjects to the study differed somewhat between the observed validation sample and the sample drawn from hospital
records. In order to insure that the observer had sufficient time to obtain informed consent, orient herself to the subject and environment, and observe interventions and responses, subjects to be observed were not admitted if they were over 6 centimeters dilated. This criterion was not applied to the audited sample. Some of the observed subjects had conditions that were beyond the boundaries of admission for the audited sample. Because the purpose of the validation sample was primarily to assess the accuracy of the chart record, admission criteria were adjusted to reflect that purpose and the environment of the unit. None of the validation sample was in the same time frame as the audited subjects and were not included in the analyses to test the hypotheses.

**Inclusion Criteria**

For the chart-audited group of subjects, 2,049 names from the first nine months of the 1993 census of over 3,000 names were selected by computer from the Hospital Information Services data base as potential subjects. From this list, a total of 375 records were examined before 130 low risk subjects were identified. No subjects were admitted and then withdrawn. The reason 375 records were examined before 130 subjects could be admitted was due to lack of refinement in the ICD-9 coding system or failure of retrieval of the records from Health Information Services. No subjects that met inclusion criteria were rejected. Criteria were stringently enforced; the
reasons for exclusion of the 245 women are itemized below. The essential question in determining inclusion criteria, and thus in evaluating each subject for inclusion, was, "Will this event/condition alter intrapartum management in any way from normal, routine care for a low risk parturient?" In order to be included in the study, the hospital record had to indicate:

1. The woman was considered low risk for complications during labor, birth, and postpartum. Medical, nurse-midwifery, and nursing admission notes had to indicate an essentially normal pregnancy or pregnancy problems that had resolved completely. A normal spontaneous vaginal delivery was anticipated. Generally accepted boundaries for low risk status include ages in the range of \( \geq 16 \) to \( \leq 35 \); parity \( \leq 5 \) (Hobel et al., 1973); and sufficient prenatal care (prenatal evaluation and labs completed) as determined by admitting staff. The hospital record had to be scanned in order to search out and eliminate subjects who did not meet these criteria. Forty-three potential subjects were excluded for these reasons.

2. The woman spoke and understood English. If the parturient was compromised in communicating with her care providers, her responses to the labor and the interventions used may be altered. This was noted to be the case in one of the pilot studies; however no subjects met this description in the sample for this research.
3. Labor commenced with either spontaneous contractions or spontaneous rupture of membranes followed by contractions. Spontaneous rupture of membranes prior to admission to the hospital and prior to onset of contractions required special criteria to distinguish a physiological process from a pathological one. In admitting subjects to the study with spontaneous rupture of membranes before contractions started or before hospital admission, criteria were three: a) contractions at least ≤ every 10 minutes must commence within three hours; b) the subject must have contacted a care provider or come to the hospital within three hours of rupture; and c) oxytocic augmentation must not have been started before the subject was given an opportunity to labor for at least one hour in the hospital. Twenty-four potential subjects with rupture of membranes were not included because contractions of sufficient quality for labor progress did not commence, or the parturient failed to report to the hospital within three hours of rupture. An additional 42 women admitted for induction of labor could not be included. Information on labor induction and early rupture of membranes was not coded into the ICD-9 system necessitating examination of each of these records.

Exclusion Criteria

The following criteria were applied to exclude potential subjects from the study:
1. The woman was attempting a vaginal birth after cesarean (VBAC). There is a higher rate of cesarean birth reported in this group of parturients (Goldman, Pineault, Potvin, Lais, & Bilodeau, 1993; Keeler & Brodie, 1993; Stafford, Sullivan, & Gardner, 1993). Women planning a VBAC were not identified separately in the ICD-9 system and could only be identified by examining the hospital record directly. Thirty-three women were excluded for this reason.

2. The woman had a planned surgical procedure including cesarean birth and postpartum tubal ligation. This information was available only by direct examination of the hospital record. Seventeen women had postpartum tubal ligations, and one had a planned cesarean birth.

3. The woman had a record notation indicating the presence of morbidity at the time of admission, such as a cold, fever, flu, or an active infectious process of any sort. Fourteen potential subjects were excluded for diagnosed disease or clinical symptoms of infection at admission. The conditions represented fever of unknown origin, urinary tract infection, positive test for beta hemolytic streptococcus infection, sexually transmitted disease, and upper respiratory infection. These conditions are usually not coded into the ICD-9 system as major diagnoses. Until the hospital record was examined, these potential subjects could not be identified and excluded.
4. The woman experienced pregnancy related disease diagnosed before admission. Twenty potential subjects were excluded for pregnancy induced hypertension, placenta previa, placental abruption, multiple gestation, malpresentation, cephalopelvic disproportion, and oligohydramnios. Multiple codes were present for most subjects, some of which were admissible and allowed these records on the list of potential subjects. Only direct examination of the hospital record allowed identification and exclusion of these persons.

5. The woman was carrying a fetus with a diagnosed condition that could compromise the labor and birth experience. Nine potential subjects were excluded for prenatal diagnosis of intraventricular septal defect, hydrocephaly, persistent bradycardia, macrosomia, intrauterine fetal death, and intrauterine growth retardation. Multiple codes were present for most subjects, some of which were admissible and allowed these records on the list of potential subjects. Only direct examination of the hospital record allowed identification and exclusion of these persons.

6. The woman had a chronic medical problem with the potential of compromising labor and birth. Twenty potential subjects were excluded for fibroid uterus, cardiac condition, diabetes, hypothyroidism, asthma, and multiple sclerosis. Multiple codes were present for most subjects, some of which were admissible and allowed these records on the list of potential
subjects. Only direct examination of the hospital record allowed identification and exclusion of these persons.

7. The woman had a precipitous labor of less than 3 hours (Oxorn, 1986). Coding of precipitous labor into the ICD-9 system was inconsistent. This excluded eight potential subjects.

In addition, four potential subjects were not admitted to the study because one had a positive toxicology screen, one gave birth at home attended by a fireman and then was admitted to the hospital, one gave birth into the toilet bowl of the triage room at MHW, and one record was completely lost in the Hospital Information Service files. Many of the 245 randomly drawn subjects not admitted to the study had multiple reasons for their exclusion. They were classified by only one of several they may have had in the foregoing reasons for exclusion. Ten records were repeatedly requested but had not been retrieved by the time 130 subjects were collected. These records were unavailable for various reasons, usually because they were in the possession of another requester.

Selection error was a threat to this research despite stringently applied inclusion-exclusion criteria. Subjects may have concealed conditions such as substance abuse so not all conditions present may have been recorded. Errors of researcher judgment in implementing criteria for subject selection are possible and likely to be systematic. As was anticipated, potential
subjects presented with histories and combinations of events that might or might not alter management of intrapartum care. The task was to make a defensible decision on admission to the study for each of the equivocal cases. For each record examined, notes were made on why the case was included or excluded.

Instrumentation

Instruments used to record and measure the variables of interest are reviewed using a model proposed by Waltz, Strickland, and Lenz (1984). Following this model, each instrument/measure is discussed relative to its purpose, conceptual basis for the instrument, and psychometric properties. The instruments to measure the variables of the hypotheses included older instruments in common use, such as the Apgar score and Hobel morbidity score for neonates, and instruments developed by the PI to meet the needs of this research.

Invasive Interventions

Measurement

The independent variable for this research was operationalized by summing the number of different invasive intrapartum interventions (NODI) that occurred during each subject’s labor and birth. Two concepts inherent in the independent variable were important to capture. The first, invasiveness, was captured by limiting the interventions to those defined as invasive by the
typology of intrapartum interventions (Appendix B). The second concept was the accumulation of invasiveness, and this was captured by summing the NODI that occurred.

Measurement of NODI was recognized as a first step in assessing the value of the concept as a predictor of outcomes. Each intervention produces outcomes, some that are the desired effect and some that are side effects and undesirable. No instrument was available that measures the independent variable, invasive intrapartum interventions. Morris et al. (1993; D. Morris, personal communication, August 30, 1993) have begun development on an instrument to measure the intrusiveness of intrapartum interventions, but this instrument is in rudimentary form and not published.

The population sampled for this initial use of NODI were low risk parturients and their fetus/neonates. The setting was an obstetric service in a tertiary level hospital during three stages of labor and birth. Underlying assumptions were (a) the invasiveness of the interventions was cumulative, and (b) the outcomes were proportionate to the degree the physiology was deranged. This measure was based conceptually on the typology of intrapartum interventions discussed in the first chapter. This was the first known time that this measure has been tested.
Mechanics of operationalization

All intrapartum interventions that occurred to the parturient and met the criteria of invasiveness as defined by the typology of interventions were counted. Initially, each intervention had been scored one for each time it occurred, and then the length of labor was factored in to create a rate of interventions per hour. The assumption of normal distribution was violated with this plan. Furthermore, the function of dividing the hours of labor by the number of interventions penalized women with very short hospital length of labors so that their rates were disproportionately high for the actual number of interventions received.

In reviewing how the data were entered and coded, episodic interventions, such as vaginal exams, had been entered for each recorded occurrence. The number of vaginal exams appeared to have no relationship to the status of the parturient, but rather to whom the care provider might be and if there was a learner (medical student) involved in the care activity. Continuous interventions, such as epidural analgesia, also were entered by episode, which was either none or one per labor. This gave unusual weight to episodic interventions such as vaginal exams and catheterizations, while continuous interventions such as epidural anesthesia, arguably more invasive, were not weighted. The effect was to skew the distribution of interventions. When each different invasive intervention was scored once,
regardless of how many times it was applied, the assumption of normal
distribution was maintained.

No distinction was made relative to the purpose of the intervention or
the recipient, only that it was invasive in some way. Thus a single score was
given for an intervention to the fetus, such as fetal scalp blood sample even
though another invasive intervention, vaginal exam, also occurred to the
parturient. Vaginal exam received one score as an intervention that occurred
during labor, even though it was performed multiple times. Epidural
anesthesia, a complex intervention involving several drugs and injections,
was scored only once. As drugs were given, each was counted as a
systemic invasive intervention, but only once. No score was given for
repeated doses or for the injection method. This had the effect of making the
measure of invasiveness of interventions relatively crude and exceptionally
conservative.

Description of Selected Invasive Interventions

The interventions selected for study fell into the four categories of
invasive interventions (see Typology of Intrapartum Interventions in Appendix
B). Intervention combinations were not a separate category but involved two
or more interventions that are part of the four categories described. Such an
intervention combination was epidural anesthesia which included multiple
systemic drugs and multiple injections. Cesarean birth, clinically an
intervention, is frequently an outcome variable in obstetrical research (Baruffi, Strobino, & Paine, 1990; Goyert, Bottoms, Treadwell, & Nehra, 1989)). Following that model, cesarean birth in this research was considered the cumulative outcome of previous labor decisions. The most common invasive interventions anticipated in this research are defined and discussed briefly.

**Drugs.** All drugs given to the parturient cross the placenta and affect the fetus, either directly or indirectly through side effects in the mother (Wheeler, 1985). A compromise in neonatal neural function from narcotics has been recognized for some time (Brazelton, 1961; Ettinger & McCart, 1976) and continues to be an issue of concern and controversy (personal communication, D. Haire, November 30, 1993; Wheeler, 1985). Some drugs, such as those used with epidural anesthesia, appear to cause hyperthermia in some parturients. If the parturient's temperature is elevated due to drugs, infection, exhaustion, or dehydration, the fetus' temperature may be elevated significantly higher than the mother's. The sequelae from intrauterine hyperthermia is not known (Macauley, Bond, & Steer, 1992).

Barbiturates are still prescribed for women in prodromal and latent labor. Barbiturates and narcotics may depress the brain metabolism of the fetus to the point where oxygen is not conserved. Any factor that decreases oxygen to the fetus increases the likelihood that a depressed infant will be born (Brazelton, 1961).
Lidocaine is a time-honored anesthetic used in midwifery and obstetrics for local anesthesia to start intravenous therapy, to anesthetize the skin before epidural administration, and for pudendal blocks and local infiltration of the perineum. Lidocaine can be detected in blood plasma one minute after administration, reaching peak concentration in three to 15 minutes. There is rapid placental transfer to significantly higher levels than those found after epidural anesthesia. The active metabolites of lidocaine are detected in neonatal urine for up to 48 hours after delivery (Philipson, Kuhnert, & Syracuse, 1984).

Oxytocin is another type of drug in common use for labor induction and augmentation. The risk of uterine hyperstimulation is increased with oxytocin. If contractions are so closely spaced that there is not adequate uterine rest between them, the fetus may be insufficiently oxygenated. Effectiveness of labor augmentation in the face of labor delay or premature rupture of membranes is questionable in light of the dearth of support for many of the interventions imposed during labor (Grant & Keirse, 1989). "Expectant and supportive care" (Crowther et al., 1989, p. 843) may be the most effective and the least harmful.

**Vaginal exams.** Vaginal exams are performed to assess the dilation and effacement of the cervix; assess the station (degree of descent of the fetal presenting part); assess fetal position; assess bony structure of the
pelvis; and perform procedures such as artificial rupture of membranes, insertion of fetal scalp electrode, and insertion of the intrauterine pressure catheter. Each vaginal exam carries with it the risk of introducing bacterial contamination into the vagina and causing a nosocomial infection of mother and/or fetus (Cunningham, MacDonald, & Gant, 1989). The perceived need for vaginal exams may be driven by tradition and culture (Bergstrom, Roberts, Skillman, & Seidel, 1992).

Amnionomy. The presumed benefits of amniotomy include shorter labors, access to the uterine cavity for internal fetal and uterine monitoring, and assessment of the amniotic fluid for meconium staining. In many institutions, amniotomy is a routine procedure. Amniotic fluid provides a protective cushion around the fetus and umbilical cord (Cunningham et al., 1989). Pressure during a contraction is distributed across the umbilical cord and fetal parts relatively evenly until the membranes rupture. The fetus and umbilical cord may sustain increased stress after the membranes rupture, often indicated by variable decelerations. Variable decelerations were considered an empirical indicator for increased stress in this study.

The wide spread belief that amniotomy shortens labor is debatable. Clinical observation suggested that labor often slows down midway. For the clinician who is waiting, and sometimes for the laboring parturient, any action that might speed labor is deemed worthy, and membranes are artificially
ruptured. Despite equivocal research evidence, amniotomy is so common as to be considered routine by many hospital care providers. It is a routine procedure in the protocol called active management of labor, now commonly implemented in developed countries.

**Vacuum extraction.** The advantage of the vacuum extractor over obstetrical forceps for assisted delivery is in sparing maternal soft tissue. Because of the nature of the procedure, this may be at the expense of the fetus. Cunningham et al. (1989) report lacerations and abrasions of the fetal scalp, cephalhematomas, intracranial hemorrhage, and death as complications attributed to vacuum extraction. In experienced hands, it is probably as safe a procedure as forceps and preferred by many clinicians (Johnson & Pace, 1993).

**Parenteral therapy.** Parenteral therapy, such as intravenous solutions with or without drugs, includes any drug or therapy administered internally through injection beyond the skin barrier. Parenteral therapy often occurs in combination with other interventions. An intravenous infusion or heparin lock without infusion is routine in many hospitals, including MHW.

**Internal fetal monitoring with scalp electrodes.** Special equipment, including the electronic fetal monitor, is unnecessary for careful monitoring of the mother and fetus during labor (Crowther, Enkin, Keirse, & Brown, 1989;
Grant, 1989). The fetus can be monitored safely by auscultation with a fetoscope.

There are two types of electronic fetal monitoring. The external type straps sensing devices to the parturient's abdomen. If monitoring is continuous, the parturient is limited in her ability to move freely. These external devices are labor saving for care providers by producing a continuous reading of the fetal heart rate and the frequency of the contractions. They do not indicate anything about the quality of the fetal heart rate or contractions however, as the internal monitors do.

Internal fetal monitoring entails insertion of equipment into the vagina and piercing the fetal scalp with a wire corkscrew or pinching it with a clamp. To monitor the intensity of contractions internally, a fluid-filled catheter is introduced between the fetus and the uterine wall. These procedures have increased progressively in the United States since the 1970s (Kozak, 1989). In many hospitals internal monitoring is routine, and in other hospitals and birth centers it accompanies any alarming fetal heart rate variation. Sometimes the equipment does not attach properly necessitating repeated invasion of the vagina and fetal scalp to reinsert the electrode or catheter. Scalp abscess, hemorrhage from the wound on the scalp, and infection may occur (Cunningham et al., 1989).
Hon's (1975) seminal research on fetal heart rate monitoring identified three types of decelerations - early, late, and variable. Early decelerations mirror uterine contractions and are recognized as innocuous reflections of fetal head compression. Late decelerations are generally indicators of chronic fetal distress resulting from uteroplacental insufficiency, especially ominous if accompanied by minimal or absent beat-to-beat variability in the fetal heart rate rhythm and slow recovery to baseline. Variable decelerations, including persistent end-stage decelerations with dramatic falls to 60-90 beats per minute, attributed to cord compression are common during late second stage without consensus on how to assess and manage this phenomenon (Boehm & Boehm, 1981; Lloyd, 1985); earlier and persistent appearance of variable decelerations may signal acute fetal distress. Fetal heart rate decelerations preceding or concurrent with bradycardia are of grave concern (Roberts, 1989). A usual baseline is 120-160 beats per minute. Persistent fetal heart rate above 160 beats per minute is considered tachycardia; and below 120, bradycardia. Beat-to-beat variability is an important indicator of fetal well-being also. A minimal or absent (flat line) beat-to-beat variability may indicate a sleep cycle in the fetus or the effect of analgesics, but it also can be a sign of a compromised fetus.

Fetal scalp blood sample. This procedure is indicated when a fetus appears compromised, and the benefit is in avoiding a cesarean birth for fetal
distress (Urang, Davis, Elsberry, & Kozlowski, 1993). A sample of fetal scalp blood is taken by pricking the scalp and collecting the blood in a capillary tube. The risks are the same as those that accompany the use of fetal scalp electrodes.

**Episiotomy.** In findings from a retrospective, descriptive study of 3,065 deliveries, 13.0% of the women experienced a third or fourth degree episiotomy extension (Green & Soohoo, 1989). Of the 760 women who had no episiotomy, 47.7% had no lacerations. The adjusted risk of rectal laceration was increased significantly with midline episiotomy (compared with no episiotomy), nulliparity, fetal macrosomia, delivery by a physician (alternative was a midwife), and delivery in a delivery room rather than a labor bed. The authors questioned the practice of routine episiotomy, an intervention which also appears to impede perineal healing (McGuinness, 1991). At one to two weeks postpartum, 181 women with episiotomies and 186 women without episiotomies were compared for perineal healing. Delayed healing due to wound separation or infection occurred in 4.9%. Of the total sample, the episiotomy group experienced a rate of 7.7% delayed healing compared with 2.2% in the group without episiotomies.

**Forceps.** DeLee advocated routine prophylactic forceps (Leavitt, 1988), and this tradition persisted for many years before declining. Cunningham et al. (1989) attributes an alleged increase in use of forceps
(Zahniser et al., 1992 disputes such an increase) to the current high use of epidural anesthesia. The pelvic floor becomes lax under the anesthetic, and the presenting part has more difficulty with physiologic rotation. Urge and ability of the parturient to push may be compromised also.

**Intrauterine pressure catheter.** Intrauterine pressure catheters along with internal fetal monitoring require ruptured membranes and sufficient dilation to insert the fluid-filled pressure catheter. Cunningham et al. (1989) warn that early amniotomy carries with it the dangers of cord prolapse, infection, and stress on the umbilical cord and fetus from the loss of the amniotic fluid cushion. Acute reduction of amniotic fluid produces variable decelerations. Other hazards include rupture of a placental blood vessel and uterine perforation.

**Amnioinfusion.** If loss of amniotic fluid is accompanied by variable decelerations, it seems reasonable that variable decelerations would be relieved by raising the fluid level within the uterus. This is what is done during amnioinfusion. A catheter is used to introduce normal saline into the uterine cavity to replace the fluid that is no longer there. The advantage of amnioinfusion is in avoiding a cesarean birth and in thinning meconium to reduce the risk of meconium aspiration at birth. Risks are cord prolapse, infection, restriction of mobility, overdistension of the uterus, and temperature instability in the neonate (Snell, 1993).
Manual removal of the placenta. Manual removal of the placenta is reported to be done routinely by some clinicians (Cunningham et al., 1989). Appropriately, it is a procedure used for third stage hemorrhage and retained placenta. As with any invasion of the body, infection is a major risk.

Regional method of pain management. The epidural route is the most invasive and most favored method of analgesia and anesthesia for pain relief during labor and birth currently. Increasingly, observation from the scientific literature suggests an increased risk of hyperthermia, fetal distress, and cesarean birth with epidural pain relief (Kennell, Klaus, McGrath, Robertson, & Hinkley, 1991b; Macaulay, Bond, & Steer, 1992). MacLennan (1978) reported a fivefold increase of instrumental delivery and a threefold increase in malposition of the fetal head with the use of epidural for pain management. Other relatively common side effects of epidural pain management that clinicians are advised to avoid include hypotension, infection, allergic reaction, post lumbar puncture headache, and backache in addition to rare and idiosyncratic responses (Cunningham et al., 1989; Nicholson & Ridolfo, 1989; Stickles, 1993). Some women will have inadequate or no pain relief from an epidural.

Instruments Developed for this Research

Three data collection and coding instruments were constructed by the PI to record data for the independent and outcome variables. The purpose of
each instrument was to facilitate accurate and reliable recording of all invasive intrapartum interventions and the outcomes as described in the hypotheses and research question, within the organizational framework of the research.

The first step in the process of constructing these instruments was observation during birth. During the initial observations, the PI recorded in long hand each intervention and response chronologically. This enabled the PI to get a sense of the timing, types of interventions, outcome responses, social environment, and interaction between members of the staff and between the staff and patient and family. The amount and type of data were analyzed, and the scope of the data to be collected was narrowed. Two data recording instruments emerged from this initial effort. These instruments can be reviewed in Appendix D.

**Intrapartum Chronological Data Collection Form**

To record the interventions and the time that they occurred, the Intrapartum Chronological Data Collection form was developed by the PI. The instrument was adapted from narrative form to a lengthy two page check list, with interventions on one page and responses on the other. The two page system was cumbersome both during observations and when collecting chart data during the third pilot study. Finally a single page version, close to the final product, emerged. Minor refinements continued to be made on the
instrument to accurately record the events commonly observed or abstracted, without making it unwieldy.

The one page version proved convenient and efficient, both for direct observation and for chart audit. There were spaces for recording real time at the top, continuous or commonly occurring interventions and responses were recorded on the left margin and across the page by time of occurrence, and episodic interventions and responses, called Options, were enumerated on the right margin. The instrument has across-the-page continuous data spaces for Options codes. The instrument enabled the data collector to accurately reflect a chronological picture of the events that occurred during labor and birth. From the chronological record, contraction pattern changes and subtle baseline changes in the fetal heart rate were documented. The instrument is easily adaptable to changes in types and application of interventions or to other environments.

**Coding Guide for Intrapartum Chronological Data**

This guide adhered to the purposes of this study and enabled the researcher to abstract from the Intrapartum Chronological Data Collection Form, those data pertinent to the hypotheses or research question. The instrument guided the researcher in an interim step between data collection and data entry. The instrument was not used for very short labors, but was
invaluable in sorting out the vast amount of data that accompanied a long labor.

**Mother-Baby Intervention Study Chart Audit Form**

This form contained all other information pertinent to the study that occurred outside the events during labor. Birth information was recorded on this form, as well as demographic, postpartum, and neonatal outcome data. Though the form was developed at the same time as the intrapartum chronological form, it was necessary to separate the two in order to preserve the parsimonious nature of the chronological form. Forms from other chart audit studies were reviewed and served as models for this form.

The form requests specific information on the left two-thirds of the form with appropriate codes for the data. On the right side of the form are spaces for coding the data. This format enabled data entry to proceed with a minimum of searching for the correct codes. It also provides an opportunity for a data coder to review the data gathered, highlight any incongruent or missing data to be checked and corrected, and to correct any errors made by the data collector who initially indicated the codes. This form also went through innumerable revisions throughout the pilot study. Minor changes continued to be necessary into the first 50 subjects of the study data collection.
Length of stay may provide evidence of criterion validity. Length of stay in an institution following labor and birth is often an outcome of morbidity and might be expected to vary directly with invasiveness of interventions. For the neonates in this research, length of stay was assumed to vary directly with the degree of trauma or illness experienced. It is an important variable to administrators because of the potential relationship to cost effectiveness (Holzemer, 1990).

Validity and Reliability of Developed Instruments

Validity

The instruments that recorded the interventions and the outcomes into the hospital record were the hospital staff of attending physicians and nurse-midwives, house staff residents and nurse-midwives, and nursing staff. Internal validity of this research was dependent on the judgment of the care provider who did the original assessment and recording in the medical chart. Because the labor unit staff included a variety of care providers, selection-instrument interaction errors were likely to be random. To deal with selection-instrument interaction error and assess the reliability and validity of data charted by unit staff, data were collected by direct observation in a separate sample (n = 6). Later these subjects' hospital records were retrieved, and data abstracted from the records were compared with data observed by
trained research observers or the PI. Percent agreement between the
observer's record and the hospital record were calculated (Table 2).

Table 2. **Interrater Reliability Between Labor Observation and Chart
Abstraction for the Validity Sample.** *(n = 6)*

<table>
<thead>
<tr>
<th>Case</th>
<th># items compared</th>
<th># agree</th>
<th>% agree</th>
<th>Observer</th>
<th>Data missed by observer</th>
<th>Chart auditor</th>
<th>Data missing in record</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28</td>
<td>26</td>
<td>93%</td>
<td>D</td>
<td>Contraction pattern; fatigue</td>
<td>A</td>
<td>Vaginal exam x 2; hunger; comments</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>24</td>
<td>69%</td>
<td>D</td>
<td>Maternal exhaustion; hypertension; catheterization; fetal heart rate variability</td>
<td>A</td>
<td>Pain response; abruption labs; deceleration x 1; vaginal exam x 1; local infiltration</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>26</td>
<td>87%</td>
<td>C</td>
<td>Contraction pattern</td>
<td>C</td>
<td>Cervical manipulation x 2; local infiltration</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>26</td>
<td>97%</td>
<td>B</td>
<td>--</td>
<td>B</td>
<td>Scalp stimulation</td>
</tr>
<tr>
<td>5</td>
<td>42</td>
<td>37</td>
<td>88%</td>
<td>C</td>
<td>Vaginal exam x 1; change in dose of oxytocin</td>
<td>C</td>
<td>Fetal heart rate variability; pain response; vaginal exam x 2</td>
</tr>
<tr>
<td>6</td>
<td>27</td>
<td>22</td>
<td>82%</td>
<td>B</td>
<td>Fetal scalp electrode, scalp stimulation</td>
<td>A</td>
<td>Bradycardia; fetal heart rate variability; nausea/vom -iling</td>
</tr>
</tbody>
</table>

*Note.* Letters are used to protect identity of research assistants.
The lowest agreement occurred for Case Two. This case was complicated by a patient identification problem resulting in a plan of management being implemented and then abruptly changed. This was the type of environmental circumstance that only observation might detect clearly and that the validation sample was designed to explore. The circumstances probably allowed the observer to miss some of the activity, while other activity was never placed in the permanent record.

Another observation that became clear from the validation sample was that vaginal exams were so frequently done as not to be charted each time. Members of the research team who were experienced labor and delivery nurses or nurse-midwives were aware that for each patient held in triage for any period of time, a minimum of two vaginal exams were done. These exams often were not recorded in the chart.

**Reliability**

Reliability was assessed by interrater and intrarater reliabilities for all data collection and by interrater reliability between data recorded on the hospital record and that observed by researchers in the birth setting. The PI and research assistants abstracted and coded data from hospital records. Strategies to reduce error included prior training sessions, frequent team meetings, and interrater reliabilities for chart audit (Table 3). The PI trained the research assistants before observations began. The lowest acceptable
Table 3. Inter- and Intrarater Reliability for Hospital Record Data Abstraction and Coding for the Chart-Audited Sample, \( n = 130 \)

<table>
<thead>
<tr>
<th>Data collection form, ID code #</th>
<th>Raters</th>
<th>% agreement</th>
<th>Data collection form, ID code #</th>
<th>Raters</th>
<th>% agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention study subject ID code # 302</td>
<td>A/A*</td>
<td>95%</td>
<td>Intervention study subject ID code # 136 - neonate</td>
<td>A/C</td>
<td>96%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 302</td>
<td>A/C</td>
<td>81%</td>
<td>Intervention study subject ID code # 136 - neonate</td>
<td>A/E</td>
<td>76%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 302</td>
<td>A/B</td>
<td>81%</td>
<td>Intervention study subject ID code # 136</td>
<td>C/E</td>
<td>76%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 302</td>
<td>B/C</td>
<td>81%</td>
<td>Intervention study subject ID code # 372</td>
<td>A/D</td>
<td>90%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 129</td>
<td>A/A*</td>
<td>97%</td>
<td>Intervention study subject ID code # 76 - neonate</td>
<td>A/B</td>
<td>75%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 129</td>
<td>A/C</td>
<td>89%</td>
<td>Intervention study subject ID code # 297 - neonate</td>
<td>B/E</td>
<td>82%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 129</td>
<td>A/B</td>
<td>91%</td>
<td>Intervention study subject ID code # 86 - neonate</td>
<td>B/E</td>
<td>100%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 279</td>
<td>A/B</td>
<td>87%</td>
<td>Intervention study subject ID code # 202 - neonate</td>
<td>A/E</td>
<td>83%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 136</td>
<td>C/C*</td>
<td>83%</td>
<td>Intervention study subject ID code # 39 - neonate</td>
<td>C/E</td>
<td>97%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 136</td>
<td>B/C</td>
<td>97%</td>
<td>Intrapartum coding guide - subject ID code # 82</td>
<td>A/F</td>
<td>86%</td>
</tr>
<tr>
<td>Intervention study subject ID code # 136</td>
<td>A/B</td>
<td>96%</td>
<td>Intrapartum coding guide - subject ID code # 352</td>
<td>A/D</td>
<td>95%</td>
</tr>
</tbody>
</table>

Note. *Intrarater reliabilities
level of interrater reliability was 80% (Castorr et al., 1990; Poulson, 1987; Waltz, Strickland, & Lenz, 1991).

Three paper and pencil tests were conducted and percent agreement calculated to standardize interpretation of inclusion and exclusion criteria. The results from the three preliminary tests were 80%, 81%, and 89%. After data collection commenced, equivocal cases were presented at team meetings for a consensus on conformity to the inclusion criteria and interpretation of ambiguous data. The PI made final decisions.

At intervals throughout the data collection period, interrater and intrarater reliabilities on the data collection forms and data coding forms were calculated using percent agreement to detect and correct drift of researcher focus. If agreement was below 80%, the chart was recalled, and differences were reconciled. Research assistant, E, joined the research team at a later time in the research. Her earliest scores were <80%. Until they were >80%, all charts abstracted by E were doubly abstracted to insure reliability. The results were reviewed, and interpretations of data were reconciled for uniformity until interrater agreement was >80%. All data entry and cleaning were done by the PI.
Apgar and Hobel Instruments

**Apgar Score**

**Description and use**

The Apgar score (Appendix D) is a traditionally accepted outcome measure of the impact of intrapartum events on the fetus and a frequently used tool for clinical evaluation and research. This instrument was designed as a simple "classification of newborn infants which can be used as a basis for discussion and comparison of the results of obstetric practices, types of maternal pain relief and the effects of resuscitation" (Apgar, 1952, p. 260).

The Apgar score, assessed at one minute and five minutes of age, is based on five physiological indicators of the neonate's extrauterine adaptation. Each of the five indicators can receive a score of 0, 1, or 2 (Apgar, 1953). Summed, the Apgar score can range from 0 (terminal without resuscitation) to 10 (pink, crying, oxygenating neonate with a clear airway). Apgar (1966) recommended uniformity in application of the score, with a timer used to signal the one and five minute intervals to the rater. She also recommended that rating be a nursing responsibility as the delivery attendant would have a vested interest in a favorable neonatal score.

The Apgar score is a subjective instrument which measures the condition in the neonate at a precise time. Apgar assumed the Apgar score reflected the acid-base balance of the neonate. In this study, the Apgar
score was used to provide a comparative measure with other research and to
reflect the insult the fetus may have sustained during labor and birth,
purposes congruent with Apgar's reason for developing the instrument.

Reliability and validity

When Livingston (1990) assessed the interrater reliability of the Apgar
with a sample of 41 term neonates, she followed the guidelines set by Apgar
(1966) assessing the neonate at exactly 60 seconds and 5 minutes of age.
Percent agreement was computed for total and component scores. Total
scores were compared by paired t-test and Pearson's correlation coefficient.
For the term infants, percent agreement between raters (who were clinical
staff) was 89% at one minute and 97% at five minutes. Correlations between
the total scores of Livingston and the infant record were 86% at one minute
and 75% at five minutes; t-tests demonstrated no significant mean
differences between the total scores at either one or five minutes.

The Apgar score demonstrated concurrent validity with Hobel's
antepartum and intrapartum risk scores when neonates born to the highest
risk mothers had low Apgar scores (Sokokov, & Chik, 1977). The Mann-
Whitney U Test was significant (p = 0.00002) in comparing risk groups
ranging from low/low to high/high. Josten, Johnson, & Nelson (1987) found
the Apgar score had higher correlations with neonate health status than
blood pH values, calling into question the assumption that the one minute
Apgar score reflects the acid-base balance of the fetus/neonate (Apgar, 1966).

Jennett, Warford, Kreinick, & Waterkotte, (1981) attempted to improve sensitivity and specificity of the Apgar score by designing an index that incorporated both the one minute and the five minute scores. They assessed criterion validity using the length of nursery stay, neonatal deaths, and blood pH during the first hour of life. They concluded that the one minute Apgar score and their index were comparable and superior to the five minute score in predicting adverse neonatal outcome. As originally developed, the Apgar score's simplicity remains clinically attractive, and it is universally applied for nearly all births.

Hobel Neonatal Risk Score

Description and Use

Neonatal morbidity was measured by the Hobel neonatal risk score (Appendix D), which accounts for 35 factors of morbidity (Hobel, Hyvarinen, Okada, & Oh, 1973). The aim of the Hobel risk score is to predict neonatal outcomes. Weights of 1, 5, or 10 are assigned to each of the 35 factors, if present, and 0 if not present. The weights reflect the presumed importance of the factor in predicting morbidity. The weights are added for each factor into a single score for each neonate. The unweighted Hobel score is a simple count of the number of conditions of morbidity the neonate
experienced. An assumption is that factors that occur during labor and birth that predict the neonate’s postpartum course of recovery can be identified. The conceptual basis of the tool was congruent with the aims of the current research, that is, to predict morbidity relative to number of invasive interventions. Both the weighted and the unweighted versions were used for this research. The Hobel has been expanded and adapted into part of the chart system at MHW.

**Reliability and validity**

The items of the Hobel instrument represent conditions or symptoms of conditions that are serious threats to the well being of the neonate. In this research, several neonates received a complete work-up and treatment for neonatal sepsis based on events present during labor and birth, such as intrapartum maternal fever. These neonates were scored the full weight for sepsis even when they exhibited few or no signs of sepsis.

When using either a weighted version, as the tool was designed, or a unweighted adaptation, the Hobel score has demonstrated criterion validity, concurrent validity, and internal consistency when tested on a sample of 1,600 singleton neonates (Strobino & Baruffi, 1984). Strobino and Baruffi examined the percentage distribution of number of risk factors for infants with each risk factor. These were compared with the proportions of infants with a given factor for infants with one to two, three to four, and five or more factors.
Internal consistency was demonstrated when the proportion of infants with a given factor was greater for infants with five or more factors than for those with one or two. Criterion validity was established with significant ($p = 0.05$) correlation between the Hobel scores and length of stay. The scores from the birth component were separated from the 22 factors that comprise a post-birth score. The correlation of the post-birth score with length of stay was twice that of the birth score. A chi-square goodness-of-fit technique was used to demonstrate randomness in the occurrence of the Hobel scores.

Strobino and Baruffi (1984) found the Hobel a promising measure of neonatal morbidity. In their work, they found that the unweighted sum of the neonatal risk factors was as reliable as the weighted score devised by Hobel et al (1973). D. Strobino (Personal communication, April 6, 1993) knows of no other instrument that measures neonatal morbidity, and no other instrument was located.

Data Collection

Chart-audited Sample

A retrospective chart audit of a randomly selected low risk sample from a population of parturients and neonates was the major source of data. The sampling frame was an estimated $> 3,000$ parturients who delivered between January and October 1993. These were the most recent records entered into the system. Exclusion and inclusion criteria insured that subjects
represented a low risk population. International Disease Classification, 9th edition (ICD-9) codes were used to identify potential subjects considered low risk at the time of admission to the labor and delivery unit. Codes that represented normal delivery, variations of normal delivery, and favorable or unfavorable outcomes were selected. These codes were submitted to the Director of Health Information Services, who entered the selected codes into the computer data bank. The output was a list of hospital numbers, names, and admission dates for 2,049 potential subjects. The list was manually numbered from 1 to 2,049. A list of random numbers was computer generated. Starting at a random point in the list of random numbers, and drawing without replacement, 303 record request forms were issued.

During the research sample, 65% of the computer-generated list did not meet the admission criteria for the sample. This was due to the multiple codes in the system. That is, a patient coded by one of the selected codes as admissible into the study may also have had another code that made her ineligible. In addition, some conditions, present but not acceptable to the study, were not acknowledged in the attending staff's summary and not coded in the ICD-9 system. The records required reading before these exceptions were apparent. Therefore, after the initial draw of 303 potential subjects did not yield 130 acceptable subjects, another 72 names subsequently were drawn, and the process repeated.
Stringent inclusion-exclusion criteria for the study eliminated many potential subjects that might be considered low risk in other circumstances. For example, vaginal birth after cesarean (VBAC) is a condition often managed as low risk, but which was not included in this research because the incidence of cesarean is higher in multiparas who have had a previous surgical birth (Goldman, Pineault, Potvin, Lais, & Bilodeau, 1993; Keeler & Brodie, 1993; Stafford, Sullivan, & Gardner, 1993). To include parturients identified as VBAC could bias the findings.

When the hospital records were retrieved by the hospital record room staff, an initial survey of each record was made by the PI to determine eligibility for the study. Later, the records were examined in greater depth, and sometimes more were excluded. In all, 375 of a possible 2,049 hospital records were examined for admission to the study. Of those, 245 were not admitted, and the remaining 130 were admitted into the study. After data were abstracted from the obstetrical record, the neonate's record (n = 129) was retrieved and data abstracted. One neonate's record was lost in the storage system. In total, 505 parturient and neonate records were requested, 495 examined, and data were abstracted from 259. The PI and research assistants collected and coded the data.
Validation Sample

For the validation sample of subjects, the first point of inclusion or exclusion occurred by reviewing the labor board, open to public view in the labor and delivery suite at MHW. The hospital record was not accessed until written informed consent was obtained. If a patient appeared to be a potential subject, the charge nurse was contacted for information regarding the admission criteria not apparent on the board. When this initial review indicated the patient may be an appropriate subject, either the primary nurse, the PI, or the research assistant approached the patient to seek her participation in the study. If the patient was attended by a private physician, the physician was contacted at this time to orient him/her to the study and gain sanction to admit the patient to the research study. If the patient was followed by the clinic staff, the resident in charge at that time was contacted. After verbally contacting all of the principals who could be in attendance at the birth, written informed consent was obtained from the subject (sample form in Appendix E). During this process, the patient read the letter of informed consent, and salient points were verbally reinforced. Informed consent forms for all observed subjects were kept in a secure file by the PI.

For data collection of the observed subjects, the Intrapartum Chronological Data Collection form was used to keep an ongoing account of interventions and maternal and fetal responses observed by the PI or
research assistants (Appendix D). The same form was used for the subsequent audit of that subject's hospital record to assess agreement between the two records.

Statistical Analysis

The report of statistical analysis begins with demographic data and data describing the birth experience for the parturient and the neonate, follows in order of the hypotheses, and concludes with potential confounding variables. This order of presentation remains consistent in the next two chapters. Demographic data, including age, parity, marital status, ethnicity (race), educational level, occupation, and economic status as represented by payer were used to describe the population sample. These data were expressed as measures of central tendency (means) and dispersion (ranges and standard deviations). Software used for data analyses was SPSS-WIN.

Hypotheses and Research Question

The null hypotheses and research question were:

Hypothesis 1. The number of different invasive intrapartum interventions (NODI) and neonates' Apgar scores are not correlated.

Hypothesis 2. The number of different invasive intrapartum interventions and neonates' Hobel morbidity scores are not correlated.

Hypothesis 3. The number of different invasive intrapartum interventions and fetal stress reactivity are not correlated.
Hypothesis 4. The number of different invasive intrapartum interventions for parturients with vaginal births and parturients with cesarean births does not differ.

Research question. Is there a relationship between the number of different invasive intrapartum interventions and physiological distress experienced by parturients during hospitalization for childbirth?

Analysis of Apgar Scores and Hobel Scores

Analyses were conducted in two phases. For phase 1, Pearson's correlation coefficients were used to analyze the independent variable, NODI, with Apgar scores and Hobel scores. In phase 2, multiple regression was used to test confounding variables as significant covariates to Apgar score and Hobel score.

Analysis of Fetal Stress Reactivity and Physiological Distress

Fetal stress reactivity

The constructs, fetal stress reactivity and physiological distress, were analyzed in phase 1 with Pearson's correlation coefficients. Fetal stress reactivity was defined as occurrence of meconium-stained amniotic fluid or episodes of variable and late fetal heart rate decelerations, or other heart rate aberrations such as bradycardia, tachycardia, or changes in beat-to-beat variability.
Care providers base their decisions on interventions for the fetus relative to their professional judgement and the output on the monitors. The functioning of the care provider, not the monitor, was the relevant action of interest for this variable and to this research. The empirical indicators for fetal stress reactivity were all dichotomous variables. When aggregated into the construct variable, the scores were summed giving weights to the variable ranging between 0 and 6. The sum of these components was used for analysis in phase 1.

**Physiological distress**

The five separate components of the construct of physiological distress are intrapartum fever, dysfunctional labor, maternal exhaustion, ineffectual pain management, and miscellaneous drug reactions and complaints. For phase 1 analysis, these components were summed giving weights to the variable ranging between 0 and 5. The assumption was that if the parturient’s symptom was charted, it represented a condition distressing enough for her to mention to, or be noticed by, a care provider. Chart notations observed would include signs or symptoms of fever (oral temperature exceeding 37.5 C.), of pain beyond that which the parturient expected for the pain relief method she had chosen, maternal exhaustion, anxiety, nausea and vomiting, hypertension, hypotension, and dysfunctional labor.
Some physiological distress may be a response to the pain control method. Side effects of analgesic and anesthetic drugs include nausea, vomiting, itching, and hypotension. Anxiety and hypertension may be indicators of distress also. Maternal exhaustion was noted to be a motivating factor in the decision to implement an instrumental delivery.

Regression was performed on the components of fetal stress reactivity and physiological distress to determine which components contributed to the total effect of each construct. For phase 2, the constructs were analyzed with multiple regression in the same manner as Apgar score and Hobel score.

**Analysis of Cesarean Births**

There were 8 cesarean births and 122 vaginal births. For phase 1, a t test was used to compare the means of the cesarean and vaginal subgroups. In phase 2, discriminant analysis was used to distinguish the characteristics separating parturients with cesarean birth from those with vaginal birth.

**Demographic and Confounding Variables**

All demographic variables were examined for spurious effects. For age, Pearson's correlation coefficient was used to assess the association between the variable and the number of interventions. Economic status, ethnicity, marital status, and parity were converted to dichotomous variables, and t test was used to determine the difference between two groups. Care providers, education, and employment were assessed using one-way
analysis of variance (ANOVA). The Duncan Multiple Range post hoc comparison statistic was applied to determine the source of significance.

Pearson's correlation coefficient was used to test for hospital length of labor (HLOL) as a confounding variable for the hypotheses. A t test was used to detect a difference in group means for parturients who received epidural analgesia and those who did not. Then, these subjects were stratified into two groups to analyze the significance of epidural pain management, as a singular intervention, in predicting outcomes of subjects.

Concluding Analyses

All demographic and control variables that demonstrated a significant finding relative to the number of different invasive interventions (NODI) implemented were tested for confounding. Multiple regression and discriminant analysis statistics were used for these analyses.

Summary of Chapter Three

This chapter focused on the methods used to conduct the study. The research design was explained, and the conceptual basis extended to the variables of interest and measurement plan. The sample, selection criteria, and process of sample selection were described. All instruments, developed and existing, were evaluated. The site for data collection and the process of direct observation and chart audit were detailed. Finally, the statistical
analyses for demographic and descriptive data, the hypotheses and research question, and control variables were described.
CHAPTER 4 - RESULTS

Descriptive Data

Sample

The retrospective, chart-audited sample included 130 subjects who were randomly selected from the sampling frame at MHW. A care provider, usually an obstetric resident, declared the parturient at the time of hospital admission to have no or low risk of complications of labor. Inclusion and exclusion criteria were applied for admission into this research. Demographic data, including age, parity, marital status, ethnicity, educational level, occupation, and economic status describe the sample (Table 4). These data are expressed as measures of central tendency (means), dispersion (ranges and standard deviations), and proportion.

The sample parturients ranged in age from 16 to 35. Subjects at the extremes of childbearing ages were excluded from the study based on their potential of increased risk. The average age was 27.7 years (SD 5.3). Over one-half of the sample were giving birth to their first child. The highest parity in this sample was four (Table 5). Selection criteria specified that no parturient over para five was included.

Source of antepartal care (private or public) and payer of hospital care (private insurance or Medicaid) were indicators of economic status. However,
Table 4. *Education, Employment, Ethnicity, Marital Status, and Economic Status Describing Sample.*

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
<th>%</th>
<th>Category</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>n</td>
<td>%</td>
<td>Ethnicity</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>&lt;12 yrs.</td>
<td>23</td>
<td>17.7</td>
<td>AfriAmer</td>
<td>60</td>
<td>46.2</td>
</tr>
<tr>
<td>HS/GED</td>
<td>36</td>
<td>27.7</td>
<td>EuroAmer</td>
<td>60</td>
<td>46.2</td>
</tr>
<tr>
<td>1-4 yrs. coll</td>
<td>24</td>
<td>18.5</td>
<td>Other</td>
<td>10</td>
<td>7.8</td>
</tr>
<tr>
<td>BS/A</td>
<td>31</td>
<td>23.8</td>
<td>Total</td>
<td>130</td>
<td>100</td>
</tr>
<tr>
<td>&gt;BS/A</td>
<td>12</td>
<td>9.2</td>
<td>Marital stat</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Unknown</td>
<td>4</td>
<td>3.1</td>
<td>Single</td>
<td>57</td>
<td>43.9</td>
</tr>
<tr>
<td>Total</td>
<td>130</td>
<td>100</td>
<td>Married</td>
<td>73</td>
<td>56.2</td>
</tr>
<tr>
<td>Employment</td>
<td>n</td>
<td>%</td>
<td>Payer</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Unemploy</td>
<td>42</td>
<td>32.3</td>
<td>Insured</td>
<td>70</td>
<td>53.8</td>
</tr>
<tr>
<td>Student</td>
<td>19</td>
<td>14.6</td>
<td>Medicaid</td>
<td>56</td>
<td>43.1</td>
</tr>
<tr>
<td>Profession</td>
<td>31</td>
<td>23.8</td>
<td>Other</td>
<td>4</td>
<td>3.1</td>
</tr>
<tr>
<td>Total</td>
<td>130</td>
<td>100</td>
<td>Total</td>
<td>130</td>
<td>100</td>
</tr>
</tbody>
</table>

these two measures turned out to be nearly identical, so only payer was retained in the analysis. Just one subject, who had medical insurance, appeared to have used a public funded clinic for prenatal care. This subject was combined with the insured group.

Table 5. *Parity of Sample by Number and Percent.*

<table>
<thead>
<tr>
<th>Parity</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>73</td>
<td>37</td>
<td>11</td>
<td>8</td>
<td>1</td>
<td>130</td>
</tr>
<tr>
<td>%</td>
<td>56.2</td>
<td>28.5</td>
<td>8.5</td>
<td>6.2</td>
<td>0.8</td>
<td>100</td>
</tr>
</tbody>
</table>
Data Describing the Birth Experience

The parturient's experience

All subjects entered the hospital having no known risk factors that would compromise labor and delivery. The admitting care provider who examined the parturient anticipated a spontaneous and uncomplicated labor and delivery. Of 130 subjects, 8 (6.2%) labors culminated in cesarean births, 26 (20%) required assistance for delivery (forceps and/or vacuum extraction), and 96 (79%) were spontaneous, vaginal births. Of the latter, 3 (3%) required McRoberts' maneuvers for shoulder dystocia.

Parturients were asked at admission what their plans for labor pain management were, if any. The responses and the breakdown of what the subjects eventually received for pain management are displayed in Table 6. Chart notations were used to assess success of pain management. The charting by the primary nurses indicated that pain management was wholly or partly inadequate for 42 (32.3%) subjects, adequate for 51 (39.2%) of the subjects, and no chart comment was recorded for 37 subjects (28.5%).

Fifty-four (42%) subjects had some type of formal childbirth education (CBE), 64 (49%) did not, and no data were available for 12 (9%) of the subjects. For parturients with epidural, the number with CBE equaled those without CBE (n = 38; 46.9% for both groups). Of the parturients who did not have an epidural, 26 (53.1%) had CBE and 17 (32.7%) did not.
Primary nurses used parturient self-report to calculate the total length of labor, which ranged from 3 to 44 hours, with a mean of 11.3 hours and a standard deviation of 6.8. For this research, hospital length of labor (HLOL) was analyzed as a control variable because interventions for labor do not begin until the parturient presents at the hospital for triage. Hospital length of labor ranged from < 1 hour to > 26 hours, with a mean of 8.63 (SD 5.94).

Table 6. Description of Labor Pain Management Plans and Implementation.

<table>
<thead>
<tr>
<th></th>
<th>Natural childbirth</th>
<th>Epidural</th>
<th>Undecided</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned n</td>
<td>28</td>
<td>66</td>
<td>25</td>
<td>11</td>
<td>130</td>
</tr>
<tr>
<td>Planned %</td>
<td>21.5</td>
<td>50.8</td>
<td>18.3</td>
<td>8.5</td>
<td>100</td>
</tr>
<tr>
<td>Received n</td>
<td>33</td>
<td>81</td>
<td>18</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td>Received %</td>
<td>25.4</td>
<td>62.3</td>
<td>13.8</td>
<td>17.7</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Note. Totals vary because some subjects received more than one pain management method.

Of 122 vaginal births, 42 (34%) parturients received an episiotomy. Of the 80 (66%) who did not, 52 (65%) required perineal repair, making a total of 94 (77%) subjects who experienced perineal repair. The average blood loss was 330 cubic centimeters (cc), ranging from a low of 100 to 650 cc. (SD = 125 cc.). For length of stay, the mean was 2 days, and the range was from 1 to 4 days (SD 0.78). If a longer length of stay was required for a neonatal problem, mothers were discharged from the postpartum unit and became
boarders at the hospital. For this research, these subjects were considered discharged at the time the postpartum unit discharged them.

**The neonate's experience**

Seventy-seven (59.2%) boys and 53 (40.8%) girls were born to the 130 subjects. Birthweights ranged from 2,123 to 4,635 grams with a mean of 3,463 grams and standard deviation of 474 grams. Subjects beyond the range of 37 - 42 weeks gestation were excluded from the study; the range of gestational ages of the neonates was congruent with the parturients' range of gestation. Seventy-eight (60%) neonates were breast fed, and 52 (40%) were formula fed.

During labor, 27 (20.8%) fetuses demonstrated meconium-stained amniotic fluid. Of those with a vaginal birth (n = 122), 20 (16%) were intubated, and meconium was detected and suctioned from below the vocal cords in 5 (25%) of the 20. Five of the vaginally delivered neonates required resuscitation efforts, 19 (15.6%) were given oxygen after birth, but none required pharmacological respiratory stimulants. Length of stay for neonates ranged from <1 day to 13 days, with a mean stay of 2.1 days and a standard deviation of 2.0.

As Table 7 demonstrates, Apgar scores at one minute were nearly one point and 0.68 standard deviations lower than at five minutes. This affirmed the choice of the one minute Apgar as a measure more reflective than the
five minute Apgar of insult that may have been suffered during labor. At the age of 10 minutes, all neonates with initial Apgar scores below 7 reached a state of physiologic recovery.

Table 7. The Number, Percent, Mean, and Standard Deviation of the 1, 5, and 10 Minute Apgar Scores.

<table>
<thead>
<tr>
<th>Score</th>
<th>1-minute score</th>
<th>5-minute score</th>
<th>10-minute score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>1.5</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0.8</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>2.3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>0.8</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>3.8</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>5.4</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>60</td>
<td>46.2</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>51</td>
<td>39.2</td>
<td>117</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>130</td>
<td>100</td>
<td>130</td>
</tr>
<tr>
<td>Mean</td>
<td>7.962</td>
<td></td>
<td>8.808</td>
</tr>
<tr>
<td></td>
<td>(SD 1.5)</td>
<td></td>
<td>(SD .82)</td>
</tr>
</tbody>
</table>

Variables

Independent Variable

The independent variable for this research was the number of different invasive intrapartum interventions (NODI) experienced by low risk parturients.
during labor and birth. Figure 3 illustrates the mean, standard deviation, and distribution of the independent variable.

Figure 3. Distribution, mean, and standard deviation of independent variable, number of different invasive intrapartum interventions (NODI).

Each invasive intervention was counted once if it occurred anytime during the three stages of labor. All interventions defined as invasive within the boundaries set by the typology on invasive intrapartum interventions were
included in the analyses. The term low risk parturients refers to those women who are admitted to the labor and delivery unit, examined by a professional care provider and found to be healthy with no unresolved antepartal complications. The care provider declares them without risk or low risk and anticipates a normal, spontaneous birth.

A total of twenty-eight different invasive interventions occurred with this sample. The median number of invasive interventions was 8, and the mode was 6 invasive interventions. Table 8 lists the 28 interventions by number and percent of subjects experiencing each intervention.

**Dependent Variables**

The five outcome variables were Apgar score, Hobel neonatal morbidity score, fetal stress reactivity, cesarean birth, and physiological distress. Fetal stress reactivity and physiological distress were constructs developed to analyze the stress/distress experienced by the fetus and the parturient during labor. For the fetus, the components of the construct included meconium-stained amniotic fluid, variable and late fetal heart rate decelerations, bradycardia, tachycardia, and beat-to-beat fetal heart rate variability. For the parturient, physiological distress included the components of intrapartum fever, dysfunctional labor, maternal exhaustion, pain management, and miscellaneous distress. The means, medians, modes,
standard deviations, and ranges of the outcome variables are presented in Table 9.

Table 8. **Number of Times and Percent that 28 Selected Invasive Intrapartum Interventions were used in the Sample of 130 Low Risk Parturients.**

<table>
<thead>
<tr>
<th>Interventions</th>
<th>n</th>
<th>%</th>
<th>Interventions</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd stage oxytocin*</td>
<td>115</td>
<td>94.2</td>
<td>Forceps</td>
<td>8</td>
<td>6.2</td>
</tr>
<tr>
<td>Episiotomy*</td>
<td>42</td>
<td>34.4</td>
<td>Internal fetal monitor</td>
<td>41</td>
<td>31.5</td>
</tr>
<tr>
<td>Repair*</td>
<td>93</td>
<td>76.2</td>
<td>Seconal</td>
<td>12</td>
<td>9.2</td>
</tr>
<tr>
<td>Uterine exploration*</td>
<td>6</td>
<td>4.9</td>
<td>Intrauterine pressure catheter</td>
<td>32</td>
<td>24.6</td>
</tr>
<tr>
<td>Manual removal of placenta*</td>
<td>3</td>
<td>2.4</td>
<td>Vaginal exams</td>
<td>130</td>
<td>100</td>
</tr>
<tr>
<td>Alternatives to seconal, and other drugs</td>
<td>11</td>
<td>8.5</td>
<td>Fetal scalp blood sample</td>
<td>14</td>
<td>10.8</td>
</tr>
<tr>
<td>Intravenous/heparin lock</td>
<td>119</td>
<td>91.5</td>
<td>Stimulation of fetal scalp</td>
<td>10</td>
<td>7.7</td>
</tr>
<tr>
<td>Epidural</td>
<td>81</td>
<td>62.3</td>
<td>Oxytocin augmentation</td>
<td>43</td>
<td>33.1</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>92</td>
<td>70.7</td>
<td>Tocolytic</td>
<td>4</td>
<td>3.1</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>2</td>
<td>1.5</td>
<td>Analgesia</td>
<td>18</td>
<td>13.8</td>
</tr>
<tr>
<td>Catheterization</td>
<td>43</td>
<td>33.0</td>
<td>Pudendal</td>
<td>3</td>
<td>2.3</td>
</tr>
<tr>
<td>Cervical manipulation</td>
<td>14</td>
<td>10.8</td>
<td>Local infiltration</td>
<td>23</td>
<td>17.7</td>
</tr>
<tr>
<td>Amniotomy</td>
<td>91</td>
<td>70.0</td>
<td>Oxygen</td>
<td>21</td>
<td>16.2</td>
</tr>
<tr>
<td>Vacuum extraction</td>
<td>19</td>
<td>14.6</td>
<td>Amnioinfusion</td>
<td>3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

*Note.* n = 122 vaginal births for *variables; for the rest, n = 130.

Statistical Analyses

Analyses to test the hypotheses and research question proceeded in two phases. In phase 1, the null hypotheses were tested, and the research question was explored. Demographic and control variables were
Table 9. **Outcome Variables of Apgar Scores, Hobel Scores, Fetal Stress Reactivity, Cesarean Birth, and Physiological Distress Described by Mean, Median, Mode, Standard Deviation, and Range. n = 130**

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Standard deviation</th>
<th>Range (Max. score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-minute Apgar</td>
<td>7.96</td>
<td>8.0</td>
<td>8.0</td>
<td>1.53</td>
<td>1, 9 (10)</td>
</tr>
<tr>
<td>5-minute Apgar</td>
<td>8.81</td>
<td>9.0</td>
<td>9.0</td>
<td>0.82</td>
<td>2, 9 (10)</td>
</tr>
<tr>
<td>Unweighted Hobel</td>
<td>0.65</td>
<td>0.00</td>
<td>0.00</td>
<td>1.36</td>
<td>0, 9 (35)</td>
</tr>
<tr>
<td>Weighted Hobel</td>
<td>4.32</td>
<td>0.00</td>
<td>0.00</td>
<td>9.05</td>
<td>0, 46 (279)</td>
</tr>
<tr>
<td>Fetal stress reactivity</td>
<td>1.31</td>
<td>1.00</td>
<td>1.00</td>
<td>1.27</td>
<td>0, 5 (6)</td>
</tr>
<tr>
<td>Cesarean birth</td>
<td>0.06</td>
<td>0.00</td>
<td>0.00</td>
<td>0.24</td>
<td>0, 1 (dichotomous)</td>
</tr>
<tr>
<td>Physiological Distress</td>
<td>1.22</td>
<td>1.00</td>
<td>0.00</td>
<td>1.28</td>
<td>0, 5 (5)</td>
</tr>
</tbody>
</table>

analyzed for association with NODI. In phase 2, the demographic and control variables with a significant relationship to NODI were analyzed as alternative explanations for the findings.

**Phase 1**

**Hypothesis 1. The number of different invasive intrapartum interventions (NODI) and neonates' Apgar scores are not correlated**

Pearson's correlation was used to test the strength of the association between NODI and Apgar scores taken at one minute and at five minutes (Table 10). The null hypothesis was rejected for the one minute Apgar score
but not for the five minute one. Therefore, when NODI is greater, one minute Apgar is lower. This supports the contention that the condition of the fetus just before birth is reflected at one minute after birth more accurately than at five minutes.

For any infant with an Apgar score lower than 7, the obstetric team has already implemented interventions to restore the neonate's optimal function. Only the most severely compromised neonates would not have an acceptable Apgar score by five minutes. Those neonates then have a 10 minute Apgar score recorded.

When neonates born by cesarean birth were excluded, the results varied little. The one minute score for the 122 vaginally delivered neonates was significant (n = 122; r = -0.28; p < .01); the five minute one was not (n = 122; r = -0.12; p = 0.19). Only the one minute Apgar score was retained for further analysis.

Table 10. Number of Different Invasive Intrapartum Interventions (NODI) Correlated with Apgar Scores, Hobel Neonate Morbidity Scores, Fetal Stress Reactivity and Parturients' Physiological Distress (PhysDist).

<table>
<thead>
<tr>
<th>Measure n = 130</th>
<th>1-min. Apgar</th>
<th>5-min. Apgar</th>
<th>Unweighted Hobel</th>
<th>Weighted Hobel</th>
<th>Fetal Stress Reactivity</th>
<th>PhysDist n = 129</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>-0.29</td>
<td>-0.14</td>
<td>0.24</td>
<td>0.35</td>
<td>0.65</td>
<td>0.61</td>
</tr>
<tr>
<td>p</td>
<td>&lt;.001</td>
<td>0.12</td>
<td>&lt;.01</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
Hypothesis 2. The number of different invasive intrapartum interventions and neonates' Hobel morbidity scores are not correlated

Pearson's correlation was used to analyze both the unweighted and the weighted Hobel scores (Table 10). The null hypothesis was rejected for both versions of the instrument though the weighted version had a slightly stronger association ($r = 0.35$) with NODI and lower significance ($p < .001$) than the unweighted one ($r = 0.24$; $p = <.01$). This may or may not indicate that neonates with morbidity had conditions that were more serious and thus had conditions with higher weights. Regardless, the finding suggested that a greater NODI contributed to increased morbidity of neonates. If the neonates born by cesarean birth were withheld, the unweighted Hobel scores for the 122 vaginal births remained significant ($n = 122; r = 0.25; p < .01$) as did the weighted Hobel ($n = 122; r = 0.34; p < .001$). Subsequent analyses included only the weighted Hobel score.

Hypothesis 3. The number of different invasive intrapartum interventions and fetal stress reactivity are not correlated

Using Pearson's correlation coefficient, the null hypothesis was rejected (Table 10). This finding suggested that greater NODI contributed to increased fetal stress. Fetal stress reactivity included the variables of meconium-stained amniotic fluid, variable and late decelerations, tachycardia,
bradycardia, and beat-to-beat variability. Forty-nine fetuses demonstrated fetal stress reactivity.

Using multiple regression, a model was built to assess the components as valid correlates of NODI. The final model (Table 11) included late decelerations, tachycardia, bradycardia, beat-to-beat variability, and variable decelerations. Meconium staining was eliminated from the final model as a significant contributor to the construct.

Table 11. **NODI Predicted by the Components of Fetal Stress Reactivity using a Regression Model.** n = 130

<table>
<thead>
<tr>
<th>Variable</th>
<th>Late decelerations</th>
<th>Tachycardia</th>
<th>Bradycardia</th>
<th>Beat-to-beat variability</th>
<th>Variable decelerations</th>
<th>Meconium in amniotic fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope</td>
<td>0.23</td>
<td>0.28</td>
<td>0.21</td>
<td>0.20</td>
<td>0.19</td>
<td>0.09</td>
</tr>
<tr>
<td>t-value</td>
<td>3.10</td>
<td>4.12</td>
<td>3.04</td>
<td>2.81</td>
<td>2.71</td>
<td>1.40</td>
</tr>
<tr>
<td>Sig. of t</td>
<td>&lt;.01</td>
<td>&lt;.001</td>
<td>&lt;.01</td>
<td>&lt;.01</td>
<td>&lt;.01</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Note: R = 0.69; R square = 0.48

**Hypothesis 4.** The number of different invasive intrapartum interventions for parturients with vaginal births and parturients with cesarean births does not differ

The null hypothesis was rejected using a t test to compare the NODI means of the group of subjects with cesarean births (n = 8, mean 11.5, SD 2.51) and the group with vaginal births (n = 122, mean 7.95, SD 3.13). For a t-value of 3.14 and df 128, the 2-tail significance was p = <.01, and the
confidence interval was 1.31, 5.79. This analysis was compromised by a small number in the cesarean group.

Parturients who had a cesarean birth were more likely to be European American (62.5%), have insurance or a private funding source (75%), and have the clinical course of labor managed by an obstetrician or obstetric resident (100%). They were an average of 28.3 years old having their first baby. They labored an average of 16 hours before surgery. Description of their experiences of assisted delivery are displayed in Table 12.

<table>
<thead>
<tr>
<th>Interventions</th>
<th>n</th>
<th>%</th>
<th>Interventions</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>8</td>
<td>100</td>
<td>Vacuum extraction</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>Forceps</td>
<td>2</td>
<td>25</td>
<td>Both forceps and vacuum extraction</td>
<td>1</td>
<td>13</td>
</tr>
</tbody>
</table>

**Research Question.** Is There a Relationship Between the Number of Different Invasive Intrapartum Interventions and Physiological Distress Experienced by Parturients During Hospitalization for Childbirth?

Pearson's correlation was used to determine the relationship between NODI and physiological distress (Table 10). The significant finding suggested that greater NODI contributes to increased physiological distress in parturients. The components of physiological distress were intrapartum fever,
dysfunctional labor, maternal exhaustion, effectiveness of pain management plan, and a miscellaneous group that included drug reactions and anxiety. Pain management success had missing data for 37 cases which reduced the total number for analysis to 92. The decision was made to separate pain management from the construct for this analysis. Multiple regression was employed with the sample (n = 129) to model the remaining components as valid correlates of NODI. Miscellaneous distress was eliminated as a significant contributor to the model. The final model included intrapartum fever, dysfunctional labor, and maternal exhaustion (Table 13).

Table 13. Model of NODI Contribution to Components of Physiological Distress Analyzed by Multiple Regression.

<table>
<thead>
<tr>
<th>Valid Covariates</th>
<th>Intrapartum fever</th>
<th>Dysfunctional labor</th>
<th>Maternal exhaustion</th>
<th>Miscellaneous distress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope</td>
<td>0.33</td>
<td>0.24</td>
<td>0.16</td>
<td>0.13</td>
</tr>
<tr>
<td>t value</td>
<td>4.01</td>
<td>2.95</td>
<td>2.22</td>
<td>1.6</td>
</tr>
<tr>
<td>Sig. of t</td>
<td>&lt;.001</td>
<td>&lt;.01</td>
<td>0.03</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Note. R = 0.61; R square = 0.37

Demographic Variables

The demographic variables were examined for their relationship to the number of different invasive interventions (NODI) implemented. For parturient's age, Pearson's correlation coefficient was not significant (r = 0.01; p = 0.88). Education (Table 14) and employment (Table 15) were analyzed with one-way ANOVA. Educational level of the subjects was not a significant
factor \((p = 0.52)\) relative to the independent variable. However, employment was significantly related \((p = <.01)\). Post-hoc analysis with Duncan's Multiple Range Test confirmed that the homemaker/unemployed group was significantly different from the other three groups.

Table 14. **NODI by Educational Level Analyzed with One-Way ANOVA.** \((n = 121)\)

<table>
<thead>
<tr>
<th>Education categories</th>
<th>n</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 12 years</td>
<td>23</td>
<td>8.04</td>
<td>3.77</td>
<td>6.41, 9.67</td>
</tr>
<tr>
<td>HS/GED</td>
<td>36</td>
<td>7.56</td>
<td>3.11</td>
<td>6.50, 8.61</td>
</tr>
<tr>
<td>1-4 years college</td>
<td>24</td>
<td>8.79</td>
<td>3.74</td>
<td>7.21, 10.37</td>
</tr>
<tr>
<td>College graduate</td>
<td>38</td>
<td>8.24</td>
<td>2.37</td>
<td>7.46, 9.01</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>8.11</td>
<td>3.17</td>
<td>7.54, 8.68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F ratio</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>3</td>
<td>22.93</td>
<td>7.64</td>
<td>0.76</td>
<td>0.52</td>
</tr>
<tr>
<td>Unweighted</td>
<td>1</td>
<td>4.73</td>
<td>4.73</td>
<td>0.47</td>
<td>0.50</td>
</tr>
<tr>
<td>Weighted</td>
<td>1</td>
<td>5.13</td>
<td>5.13</td>
<td>0.51</td>
<td>0.48</td>
</tr>
<tr>
<td>Deviation</td>
<td>2</td>
<td>17.81</td>
<td>8.90</td>
<td>0.88</td>
<td>0.42</td>
</tr>
<tr>
<td>Within groups</td>
<td>117</td>
<td>1180.67</td>
<td>10.09</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>1203.60</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

The remaining demographic variables, marital status, parity, ethnicity, and economic status, were coded as dichotomous variables. Divorced and separated women were incorporated into the single category, so two
categories, married and single, were analyzed. Parity was divided into
primiparas and multiparas. There were only 10 individuals that were not of
African American or European American heritage. This small group was
dropped from the analysis. Economic status was represented by payer of the
hospital bill. Two subjects were self-pay, and two were unknown. These four
were dropped from the analysis. The remaining subjects were either insured
or recipients of Medicaid. These four variables were analyzed with 2-tailed t
tests (Table 16).

Table 15. **NODI by Employment Analyzed with One-Way ANOVA.** (n = 124)

<table>
<thead>
<tr>
<th>Employment status</th>
<th>n</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homemaker/unemployed</td>
<td>42</td>
<td>6.6</td>
<td>2.70</td>
<td>5.60, 7.49</td>
</tr>
<tr>
<td>Student</td>
<td>19</td>
<td>9.16</td>
<td>3.50</td>
<td>7.47, 10.85</td>
</tr>
<tr>
<td>Professional</td>
<td>34</td>
<td>8.97</td>
<td>3.01</td>
<td>7.92, 10.02</td>
</tr>
<tr>
<td>Other</td>
<td>29</td>
<td>8.83</td>
<td>3.22</td>
<td>7.60, 10.05</td>
</tr>
<tr>
<td>Total</td>
<td>124</td>
<td>8.17</td>
<td>3.20</td>
<td>7.61, 8.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F ratio</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>3</td>
<td>150.82</td>
<td>50.27</td>
<td>5.44</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Unweighted</td>
<td>1</td>
<td>78.19</td>
<td>78.18</td>
<td>8.46</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Weighted</td>
<td>1</td>
<td>103.15</td>
<td>103.15</td>
<td>11.16</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Deviation</td>
<td>2</td>
<td>47.67</td>
<td>23.84</td>
<td>2.58</td>
<td>0.08</td>
</tr>
<tr>
<td>Within groups</td>
<td>120</td>
<td>1109.28</td>
<td>9.24</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>1260.1</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
Table 16. Ethnicity, Parity, Marital Status, and Economic Status Dichotomized and Analyzed for Differences in NODI by 2-tail t tests.

<table>
<thead>
<tr>
<th></th>
<th>Ethnicity (n = 120)</th>
<th>Parity (n = 130)</th>
<th>Marital status (n = 130)</th>
<th>Economic (n = 126)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Afri American</td>
<td>Euro American</td>
<td>Primiparas</td>
<td>Multi-paras</td>
</tr>
<tr>
<td>n</td>
<td>60</td>
<td>60</td>
<td>73</td>
<td>57</td>
</tr>
<tr>
<td>Mean</td>
<td>7.48</td>
<td>8.62</td>
<td>9.7</td>
<td>6.2</td>
</tr>
<tr>
<td>SD</td>
<td>3.17</td>
<td>3.07</td>
<td>3.2</td>
<td>2.0</td>
</tr>
<tr>
<td>t</td>
<td>-1.99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>118</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CI</td>
<td>-2.26, -0.01</td>
<td>2.63, 4.41</td>
<td>-1.61, 0.63</td>
<td></td>
</tr>
</tbody>
</table>

Concluding the initial analyses of demographic variables, those significantly associated with a higher number of different invasive intrapartum interventions (NODI) were unemployment of the subject, African American ethnicity, and primiparas. These variables were further analyzed in phase 2 of the analysis, along with other potentially confounding variables.

Control Variables

Those significant demographic variables of employment, parity, and ethnicity became control variables. Other potentially confounding variables, specifically hospital length of labor (HLOL), procedure for epidural pain management, and care provider, were examined.
**Hospital Length of Labor.** If a woman spends more time in the hospital in labor, she may experience more NODI, or because of NODI she may have a longer labor. Pearson correlation coefficient was performed to confirm that length of labor was correlated with a greater NODI ($r = 0.51$, $p < .001$).

**Epidural analgesia/anesthesia.** An epidural procedure for analgesia or anesthesia incorporates multiple invasive interventions. For the independent variable, it was counted only once. However, if subjects with an epidural procedure also received a higher number of other invasive interventions, the premise of a cascade effect would be supported. Therefore, a $t$-test was performed with the sample ($n = 81$ with epidural, 49 without) to detect any difference in NODI between parturients with an epidural and those without. Parturients with epidural had a mean of 9.67 different interventions while those without had a mean of 5.69 interventions. The two-tail significance was $p < .001$ with a 95% confidence interval of -4.82, -3.12. With this significance, the sample was stratified into two subsets of subjects, those with epidural and those without. Pearson correlation was used to analyze the association between NODI and the 1-minute Apgar score, weighted Hobel score, fetal stress reactivity, and physiological distress (Table 17).
Table 17: NODI Correlated with Apgar Score, Hobel Score, Fetal Stress Reactivity (FSR), and Physiological Distress (PD) for Subjects with and Subjects without an Epidural Procedure for Labor Pain Management.

<table>
<thead>
<tr>
<th>Results</th>
<th>Subjects with epidural (n = 81)</th>
<th>Subjects without epidural (n = 49)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-min Apgar</td>
<td>Hobel</td>
</tr>
<tr>
<td>r</td>
<td>-0.30</td>
<td>0.33</td>
</tr>
<tr>
<td>p</td>
<td>0.01</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>

Subjects with epidural analgesia had a mean of 9.7 (SD 2.8) interventions during labor, and the mean duration of labor was 10.4 hours (SD 6.0). Subjects without epidural anesthesia had a mean of 5.69 (SD 2.0) interventions during labor and a mean duration of 5.6 hours of labor (SD 4.5). Descriptive data comparing the experience of subjects with and without epidural anesthesia are displayed in Table 18.

Care providers. Much of the research on intrapartum interventions in the literature was associated with the discipline of the care providers. To provide a comparison with this literature as well as rule out confounding, the association of care providers with NODI was examined for this sample. The care providers responsible for clinical management of labor at MHW are private practice obstetricians, private practice family practitioners, obstetric and family practice residents, and private practice and staff certified nurse-midwives (CNMs). Private family practitioners represented a group so small
Table 18. **Number and Percent Description of Subjects Stratified by Presence or Absence of an Epidural Procedure for Pain Management with Selected Invasive Interventions and Outcomes.**

<table>
<thead>
<tr>
<th>Interventions and outcomes</th>
<th>No epidural n = 49</th>
<th>Epidural n = 81</th>
<th>Outcomes</th>
<th>No epidural n = 49</th>
<th>Epidural n = 81</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Oxytocin augmentation</td>
<td>5</td>
<td>10</td>
<td>38</td>
<td>46.9</td>
<td>0</td>
</tr>
<tr>
<td>Tocolytic</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4.9</td>
<td>3</td>
</tr>
<tr>
<td>Vacuum extraction</td>
<td>2</td>
<td>4.1</td>
<td>17</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Forceps</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>8.6</td>
<td>14</td>
</tr>
<tr>
<td>Fetal scalp electrodes</td>
<td>10</td>
<td>20</td>
<td>50</td>
<td>61.7</td>
<td>4</td>
</tr>
<tr>
<td>Intrauterine pressure catheter</td>
<td>2</td>
<td>4.1</td>
<td>51</td>
<td>63</td>
<td>33</td>
</tr>
<tr>
<td>Catheterization</td>
<td>5</td>
<td>10</td>
<td>38</td>
<td>46.9</td>
<td>1</td>
</tr>
<tr>
<td>Variable decelerations</td>
<td>14</td>
<td>29</td>
<td>49</td>
<td>60.5</td>
<td>2</td>
</tr>
<tr>
<td>Oxygen</td>
<td>4</td>
<td>8.2</td>
<td>17</td>
<td>21</td>
<td>14</td>
</tr>
</tbody>
</table>

(n = 2) that they were combined with the private obstetricians, both groups having a mean number of interventions higher than any of the other groups (family practice mean = 8.5; obstetrician mean = 9.29). Likewise, family practice residents and obstetric residents were combined in a group as the family practice residents were too few to group separately (n = 5).
For analysis, the care providers were grouped into three categories by discipline and status. All CNMs, all resident physicians, and all private practice physicians comprised the three groups. Nurse-midwifery and medical students do not manage labor and birth independently. The few births attended by medical students were credited to the supervising care provider. There was one neonate delivered by the primary nurse, and one physician could not be identified. One-way ANOVA was done for the remaining 128 cases (Table 19).

<table>
<thead>
<tr>
<th>Care provider</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNM</td>
<td>14</td>
<td>7.5</td>
<td>3.11</td>
<td>5.71, 9.29</td>
</tr>
<tr>
<td>Residents</td>
<td>60</td>
<td>7.45</td>
<td>3.19</td>
<td>6.63, 8.27</td>
</tr>
<tr>
<td>Private physicians</td>
<td>54</td>
<td>9.26</td>
<td>2.99</td>
<td>8.44, 10.07</td>
</tr>
<tr>
<td>Total</td>
<td>128</td>
<td>8.22</td>
<td>3.20</td>
<td>7.66, 8.78</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>n</th>
<th>SS</th>
<th>MS</th>
<th>F ratio</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>101.16</td>
<td>50.58</td>
<td>5.27</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Within groups</td>
<td>125</td>
<td>1198.72</td>
<td>9.59</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>1299.88</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Post test comparison at the 0.05 significance level was done using Duncan's Multiple Range method. The group accounting for the significant difference was the private physicians; they used a greater NODI than the
other two groups. Residents appeared to be more like certified nurse-midwives than like private physicians.

**Phase 2**

A series of multiple regression statistics were used to test six potentially confounding variables that may explain the significant findings for the five outcome variables, 1-minute Apgar score, weighted Hobel score, and fetal stress reactivity, cesarean birth, and physiological distress. The control variables were employment, parity, epidural procedure, ethnicity, care providers, and hospital length of labor (HLOL). The five outcome variables were analyzed as dependent variables, and the process was one of backward elimination. The first regression run included the independent variable, NODI, and the six control variables. Those that did not demonstrate a significant univariate correlation with the outcome variables were eliminated at this first cut (Table 20). Care providers and ethnicity were eliminated as covariates with all outcome variables at this point. The regression was rerun with only NODI and the control variables that demonstrated significant correlations with the outcome variables.

From the final run, only those variables that remained significant were retained (Tables 21 - 24). For a lower Apgar score and increased fetal stress reactivity, NODI was the single significant predictor. Hospital length of labor,
along with NODI, remained associated significantly with a higher Hobel score and increased physiological distress.

Table 20. *Outcome Variables by NODI and Control Variables*’ **Univariate Significance after Second Multiple Regression Analysis.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>NODI</th>
<th>HLOL</th>
<th>Epidural</th>
<th>Parity</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-min Apgar (n = 130)</td>
<td>&lt; .001</td>
<td>&lt; .01</td>
<td>0.04</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Unweighted Hobel (n = 130)</td>
<td>&lt; .001</td>
<td>&lt; .001</td>
<td>0.01</td>
<td>&lt; .01</td>
<td>---</td>
</tr>
<tr>
<td>FSR (n = 130)</td>
<td>&lt; .001</td>
<td>&lt; .001</td>
<td>&lt; .001</td>
<td>&lt; .001</td>
<td>---</td>
</tr>
<tr>
<td>PhysDist (n = 129)</td>
<td>&lt; .001</td>
<td>&lt; .001</td>
<td>&lt; .001</td>
<td>&lt; .001</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

Table 21. *Apgar Score by NODI Analyzed with Multiple Regression.**

<table>
<thead>
<tr>
<th>1-min. Apgar</th>
<th>n</th>
<th>slope</th>
<th>t value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NODI</td>
<td>130</td>
<td>-0.29</td>
<td>-3.46</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

*Note: R = 0.29; R square = 0.09; F = 11.88 (df 128); Sig of F < .001*

Table 22. *Fetal Stress Reactivity (FSR) by NODI Analyzed with Multiple Regression.*

<table>
<thead>
<tr>
<th>FSR</th>
<th>n</th>
<th>slope</th>
<th>t value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NODI</td>
<td>130</td>
<td>0.65</td>
<td>9.54</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

*Note: R = 0.65; R square = 0.42; F = 91.06 (df 128); Sig. of F < .001*

Table 23. *Hobel Score by NODI and Hospital Length of Labor (HLOL) Analyzed with Multiple Regression.*

<table>
<thead>
<tr>
<th>Weighted Hobel</th>
<th>n</th>
<th>slope</th>
<th>t value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NODI</td>
<td>130</td>
<td>0.25</td>
<td>2.58</td>
<td>0.01</td>
</tr>
<tr>
<td>HLOL</td>
<td>130</td>
<td>0.21</td>
<td>2.20</td>
<td>0.03</td>
</tr>
</tbody>
</table>

*Note: R = 0.40; R square = 0.16; F = 11.91 (df 2, 127); Sig. of F < .001*

Discriminant analysis was used to analyze the characteristics that distinguish parturients who delivered vaginally from those who delivered by
Table 24. **Physiological Distress (PD) by NODI and HLOL Analyzed with Multiple Regression.**

<table>
<thead>
<tr>
<th>PC</th>
<th>n</th>
<th>slope</th>
<th>t value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NODI</td>
<td>129</td>
<td>0.40</td>
<td>5.43</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>HLOL</td>
<td>129</td>
<td>0.41</td>
<td>5.50</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Note: R = 0.71; R square = 0.50; F = 62.31 (df 2, 126); Sig. of F < .001*

cesarean birth (Tables 25 - 26). The same elimination process was used for this analysis as for the preceding regression analysis, beginning with all potential confounding variables and NODI. Those univariate statistics that were significant and that went into the final discriminant analysis run for cesarean birth were NODI (p = < .01), parity (p = 0.04), HLOL (p < .001), and epidural (p = 0.02). After the final run, only HLOL remained in the equation as a predictor of cesarean birth.

Table 25. **HLOL as a Discriminating Variable for Method of Delivery, Vaginal or Cesarean. n = 130**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wilks' Lambda</th>
<th>F</th>
<th>Significance of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLOL</td>
<td>0.89</td>
<td>15.54</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

Table 26. **Sensitivity and Specificity of HLOL as a Discriminating Variable for Method of Delivery, Vaginal or Cesarean. n = 130**

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Predicted vaginal births</th>
<th>Predicted cesarean births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaginal birth</td>
<td>122</td>
<td>122</td>
<td>0</td>
</tr>
<tr>
<td>Cesarean birth</td>
<td>8</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: Total percent correctly classified = 94%; Sensitivity = 0%; Specificity = 100%*
Criterion Validity

Using Pearson's correlation coefficient, neonate length of stay was included as a measure of criterion validity, assuming that morbid neonates would require a longer hospitalization (Table 27). Criterion validity was demonstrated. The neonates' mean length of stay was 2.10 days, ranging from 0.45 days to 13.2 days, with a model value of 0.45 and SD 1.9.

Table 27. Criterion Validity Demonstrated by Correlation of Apgar Score and Hobel Score with Neonatal Length of Stay.

<table>
<thead>
<tr>
<th>Measure</th>
<th>1-minute Apgar</th>
<th>5-minute Apgar</th>
<th>Unweighted Hobel</th>
<th>Weighted Hobel</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>-0.31</td>
<td>-0.20</td>
<td>0.41</td>
<td>0.56</td>
</tr>
<tr>
<td>p</td>
<td>&lt;.01</td>
<td>0.02</td>
<td>&lt;.01</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

The length of stay for parturients appeared to be standard and not related to morbidity, other than surgery. The mean length of stay for subjects with vaginal birth (n = 122) was 1.8 days, ranging from 0.5 days to 3.3 days postpartum (SD 0.6). Subjects experiencing cesarean birth (n = 8) had a mean length of stay of 3.9 days, ranging from 1.3 to 4.5 days postpartum (SD 0.46).

Summary of Chapter Four

The analyses began with demographic and descriptive data. The null hypotheses and research question were reviewed and analyzed. Then potentially confounding variables that could generate spurious findings were
analyzed. The concluding analyses determined the contribution of the control variables to the association between the independent variable and the outcome variables. Number of different invasive intrapartum interventions (NODI) was a strong contributor to all outcome variables. Hospital length of labor was the sole remaining contributor of significance to cesarean birth and a significant contributor to the Hobel score and physiological distress.

Strategies for analyses included Pearson's correlation coefficients, multiple regression, t tests, one-way ANOVA, discriminant analysis, and descriptive measures of proportion, convergence, and dispersion. All of the null hypotheses were rejected, and the research question demonstrated an association between greater NODI and increased physiological distress of the parturient. In the concluding analyses, cesarean birth was significantly correlated only with HLOL, though NODI was close to inclusion in the equation. Analysis of this variable was compromised by a small number of cesarean births.
CHAPTER 5 - DISCUSSION OF FINDINGS

Summary of this Research

The purpose of this research was to investigate the cumulative impact of the number of different invasive intrapartum interventions (NODI) commonly employed to provide comfort, timeliness, and safety during intrapartum. The universe sampled was low risk women anticipating an uncomplicated labor.

Two separate samples were selected. A validation sample of six subjects, observed during labor and birth, established the validity of the data recorded in hospital records. Because these subjects were not randomly selected and used slightly different selection criteria, they were not included in the statistical analysis of the chart-audited sample.

The larger random sample of 130 subjects was drawn for chart audit from the 1993 census at MacDonald Hospital for Women, University Hospitals, Cleveland, Ohio. The random sample included 122 parturients who delivered vaginally and 8 parturients who delivered by cesarean. The independent variable was the number of different invasive intrapartum interventions (NODI). The dependent variables were neonatal morbidity represented by Apgar score and Hobel neonatal morbidity score, fetal stress reactivity during labor and birth, cesarean birth, and physiological distress of parturients during labor. There were four null hypotheses and one research
question. They are:

1. The number of different invasive intrapartum interventions and neonates' Apgar scores are not correlated.

2. The number of different invasive intrapartum interventions and neonates' Hobel morbidity scores are not correlated.

3. The number of different invasive intrapartum interventions and fetal stress reactivity are not correlated.

4. The number of different invasive intrapartum interventions for parturients with vaginal births and parturients with cesarean births does not differ.

5. Is there a relationship between the number of different invasive intrapartum interventions and physiological distress experienced by parturients during hospitalization for childbirth?

With SPSS-WIN, parametric statistics were used to test the hypotheses. Analyses were conducted in two phases. In the first phase, the null hypotheses were rejected for all four hypotheses indicating that a greater NODI was associated with lower Apgar scores and higher neonatal morbidity and fetal stress. For the research question, a greater NODI was significantly associated with increased physiological distress (p < .001). The demographic variables that were significantly associated with NODI were ethnicity with a greater NODI for European Americans (p = .05) and primiparas (p < .001),
and a lower NODI for unemployed homemakers (p < .01). Three control variables were significant for a greater NODI; they were longer hospital length of labor (p < .001), epidural procedure for pain management (p < .001), and private physician care provider (p < .01). In the second phase of analyses, multiple regression was used to test the significant demographic and control variables with NODI as confounders for the outcome variables. For lower Apgar score and increased fetal stress reactivity, a greater NODI was the single significant predictor. Longer hospital length of labor (HLOL), along with a greater NODI, remained associated significantly with higher Hobel score and increased physiological distress. For cesarean birth analyzed by discriminant analysis, four univariate statistics representing a greater NODI (p = < .01), primiparas (p = 0.04), longer HLOL (p < .001), and epidural (p = 0.02) were significant. While only HLOL (p = < .001) remained in the equation after the final analysis, NODI (p = 0.20) may have remained in the equation had the cesarean birth sample been larger. NODI has potential as an important new predictor of morbidity for parturients, fetuses, and neonates. Further research with this variable is warranted.

In the following text, the findings are reviewed, discussed in detail, and compared with other research. Implications for nursing, for health care in the United States, and for future research are presented.
Comparison of Descriptive Data

Ethnicity

Table 28 compares the demographic data from this study with the ethnic mix for MHW and the Cleveland metropolitan area. The sample from the study accurately reflected the breakdown of ethnic groups reported by the hospital, which is representative of the city as a whole.

Table 28. Comparison of Ethnic Mix in Study Sample, MHW, and City of Cleveland.

<table>
<thead>
<tr>
<th>Data source</th>
<th>Date of data</th>
<th>African American</th>
<th>European American</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Cleveland</td>
<td>1990</td>
<td>47%</td>
<td>49%</td>
<td>4%</td>
<td>100%</td>
</tr>
<tr>
<td>MHW</td>
<td>1991</td>
<td>29.1%</td>
<td>25.6%</td>
<td>45.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Kvale</td>
<td>1993</td>
<td>46.2%</td>
<td>46.2%</td>
<td>7.8%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Essentially, the proportion of African Americans to European Americans appeared similar in the three samples, suggesting that they were from the same population. This supported the validity of the randomization process used to select this sample. The MHW research office apologized for the large number of the other group, which was out of proportion to the city population and probably represented incomplete reporting. In the sample for this study, only 4% did not have an ethnic identification in the hospital record.

Payer

The relationship between the number of different invasive interventions (NODI) and payer of the hospital services was not significant. Nevertheless,
6 of 8 parturients with cesarean birth had health insurance or private means to pay. Patients with private physicians had a mean of 10 interventions per labor while the clinic patients managed by obstetric residents averaged 7 interventions per labor. This concurred with recent figures indicating private, insured women had more invasive technology including cesarean births (Stafford, Sullivan, & Gardner, 1993) and that providing health insurance to low income women increased the likelihood they will have a cesarean birth (Haas, Udvarhelyi, & Epstein, 1993). If there had been a larger sample for cesarean births, the findings may have been significant for a relationship with NODI.

**Intervention Use Compared with Descriptive Studies**

The Morris et al. (1993) study was the only other research found that purports to link a group of "intrusive" intrapartum interventions to birth outcomes. However, because that exploratory work has yet to be published, their reporting was incomplete, and few statistics were available for comparison, even in the original manuscript used for presentation (personal communication, D. Morris, August 30, 1993). The Morris team selected 10 specific interventions of the many that might have been used. For their secondary analysis of a subset of 246 low risk parturients from a larger data set of 659 subjects selected in a cluster sampling technique from throughout the United States, the mean number of interventions per subject was 3.5, and...
the mode was 1. For this dissertation research, the mean per subject was 8.1 interventions, and the mode was 6. In the Morris study, some subjects had few, if any, of the 10 interventions selected, hence the low mode. The purpose of her research was to develop single indices for each intervention to measure the presence or absence of the intervention based on the complexity and intrusiveness of it. These indices had never been used before. No reliability data were available for them. The Morris team looked at outcomes, but whether or not the outcomes were linked to the 10 interventions selected, or some other interventions not selected, was undetermined.

Development of an index of invasiveness of intrapartum interventions would be a contribution to outcome research. If an increased risk of unfavorable outcomes beyond a certain number or index of invasive interventions could be documented, a uniform standard of practice may result that transcends disciplinary or institutional philosophy. Four other recent studies on interventions and outcomes were compared with this current research and are presented in Table 29.

Independent Variable

The independent variable for this research, number of different invasive intrapartum interventions (NODI), has not been tested before. The development of this variable as a predictor for perinatal morbidity rose from
Table 29. **Comparison of Percent of Intervention Use from this Research with Published Data.**

<table>
<thead>
<tr>
<th>Data source</th>
<th>Kvale (MHW)</th>
<th>Davis et al., 1994</th>
<th>Rooks et al., 1992b</th>
<th>Fullerton et al., 1992</th>
<th>Baruffi et al., 1984b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>130</td>
<td>8,795</td>
<td>11,814</td>
<td>495</td>
<td>Birth center 808</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>University hospital 817</td>
</tr>
<tr>
<td>Type of facility</td>
<td>Hospital</td>
<td>Hospital</td>
<td>Birth Center</td>
<td>Hospital</td>
<td>Birth Center</td>
</tr>
<tr>
<td>Cesarean birth</td>
<td>6.2</td>
<td>21.3</td>
<td>4.4</td>
<td>9.5</td>
<td>4.3</td>
</tr>
<tr>
<td>Forceps</td>
<td>6.2</td>
<td>20.7</td>
<td>—</td>
<td>—</td>
<td>9.7</td>
</tr>
<tr>
<td>Vacuum extraction</td>
<td>14.6</td>
<td>0.6</td>
<td>—</td>
<td>—</td>
<td>27</td>
</tr>
<tr>
<td>Assisted delivery</td>
<td>20</td>
<td>—</td>
<td>2.3</td>
<td>3.1</td>
<td>—</td>
</tr>
<tr>
<td>Labor augmentation</td>
<td>33.1</td>
<td>54</td>
<td>1</td>
<td>2.2</td>
<td>22.2</td>
</tr>
<tr>
<td>Narcotic analgesia/sedative</td>
<td>20</td>
<td>46</td>
<td>13.1</td>
<td>20.2</td>
<td>24.7</td>
</tr>
<tr>
<td>Episiotomy</td>
<td>34.4</td>
<td>—</td>
<td>23.2</td>
<td>33.7</td>
<td>43.1</td>
</tr>
<tr>
<td>Amniotomy</td>
<td>70</td>
<td>—</td>
<td>41.2</td>
<td>50.7</td>
<td>—</td>
</tr>
<tr>
<td>Local infiltration</td>
<td>17.7</td>
<td>—</td>
<td>52.9</td>
<td>—</td>
<td>0.02</td>
</tr>
<tr>
<td>Pudendal block</td>
<td>2.3</td>
<td>—</td>
<td>1.3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Epidural</td>
<td>62.3</td>
<td>64</td>
<td>0.01</td>
<td>—</td>
<td>6.9</td>
</tr>
<tr>
<td>&gt; 4 vaginal exams</td>
<td>66.9</td>
<td>—</td>
<td>44.3</td>
<td>52.9</td>
<td>—</td>
</tr>
<tr>
<td>Internal monitors</td>
<td>39.2</td>
<td>—</td>
<td>0.9</td>
<td>7.7</td>
<td>—</td>
</tr>
</tbody>
</table>

**Note.** --- indicates data were not available from the publication reviewed.
clinical observation, research on differences in care providers' practice styles in the scientific literature and references in the literature to a "cascade of interventions" precipitated by an initial invasive intervention. The variable in its current form is a crude measure that bears refining. It was used in the most conservative manner possible in this research. The finding that NODI made a significant contribution to the association with the outcome variables suggests this concept has potential as an exciting addition to standards for evaluating and guiding clinical nurse-midwifery and obstetrical practice.

Outcome variables

Apgar Score

The Apgar score is a relatively insensitive instrument. It has become more or less a tradition in birthplaces all over the world. Clinically, no clinician waits to begin resuscitation until the first Apgar score is assessed at one minute. The clinician recognizes the depressed neonate at birth and begins resuscitation efforts immediately. By the time the five minute score is taken, a mildly depressed neonate should be functioning well. The insignificant correlation between invasive interventions and five minute Apgar scores was not surprising. The significance of the one minute score was rewarding given the alleged insensitive nature of the instrument.

The Rooks et al. study (1992b) of outcomes in 89 birth centers, where interventions were low for a low risk population, reported Apgar scores of <7
for 4.2% (n = 501) at one minute and 0.4% (n = 50) at five minutes. From the sample at MHW with higher use of invasive interventions, Apgar scores <7 were 15.8% (n = 12) at one minute and 1.6% (n = 2) at five minutes. This considerable difference adds weight to the one minute Apgar score as an indicator of the impact of invasive interventions during labor and birth.

**Hobel score**

This instrument was designed by Hobel to yield a weighted score. Strobino and Baruffi (1984) found no difference in reliability and validity whether it was weighted or not. In fact, they recommended its unweighted use.

In this research, the weighted Hobel score was slightly more sensitive than the unweighted to a difference in the intrauterine trauma a neonate experienced. This may suggest that the neonates in this dissertation research who experienced trauma, demonstrated a high-scoring morbidity - an issue of quality rather than quantity. The neonates that were sick, were seriously sick. Some required admission to the Neonatal Intensive Care Unit, parenteral support, and antibiotic therapy. While the neonate was hospitalized, the mother could become an in-hospital boarder to continue bonding and feeding her infant as the infant was able. If an excessive amount of intrapartum invasiveness is a causal factor, the health care
implications may be enormous in terms of the cost and the emotional and physical health of the neonate and family.

Fetal Stress Reactivity

The components of this construct tend to be highly related to each other clinically. All components that are assessments of the fetal heart rhythm and rate remained in the model. Only meconium-stained amniotic fluid was not a valid correlate of NODI.

Meconium-stained amniotic fluid

This sign has long been regarded by clinicians as a red flag for possible development of trouble, but not a consistently reliable one. The theory is that a depressed fetus experiences relaxation of the rectal sphincter and intrauterine stooling occurs. In fact, many subsequently healthy neonates have meconium-staining during labor. A singular specific danger is that of aspiration of meconium with the first breath. Meconium is highly irritating to the alveoli, setting off a virulent chemical pneumonia. Meconium-stained amniotic fluid remains an indicator of a potentially serious hazard and cannot be discounted as an indicator to care providers that the delivery needs to be managed cautiously and in a manner that prevents meconium aspiration. However, consideration could be given to eliminating meconium-staining from this construct as a predictor of general fetal morbidity.
Tachycardia

The theory behind why tachycardia occurs in the fetus is that the heart rate speeds up in an attempt to deliver more oxygen to the fetal tissues as the fetus becomes increasingly acidotic. Tachycardia also accompanies fever, and may be a fetal response to maternal fever. When the parturient experiences fever, the fetus experiences an environment that is a higher temperature than the parturient registers (Macauley et al., 1992). The fetus has no mechanism to discharge or to escape from the heat. These neonates have high potential for being born ill.

Late decelerations

Late decelerations refer to a particular pattern in the fetal heart rate in which the deceleration begins midway into a contraction and lasts some time after it ends. The length of time for recovery of the fetal heart to baseline rate is important. The slower the recovery, the more ominous is the prognosis. If late decelerations deteriorate into a persistent bradycardia, the situation may be grave. On the other hand, end-stage decelerations, which are deep variable decelerations occurring at the end of second stage, or a prolonged end-stage bradycardia are not as uncommon or ominous.

Beat-to-beat variability and variable decelerations

Beat-to-beat variability and variable decelerations may represent potential morbidity, or they could have explanations representing normal
variations. For example, any narcotic administered to the mother can cause
loss of beat-to-beat variability. While this is not considered an alarming sign
for fetal morbidity, for the construct it signals an invasive intervention.

In use of the construct in future research, a clinical sense of the
importance of the components must be considered in addition to the results of
the multiple regression model. With the advent of electronic fetal monitors,
the interpretation of fetal heart rate variations has been studied a great deal.
A contribution to clinical management would be an index that might predict
neonatal health at birth, an "Apgar" score for the fetus, perhaps. This
construct bears refining; it could be a useful measure for future research.

**Cesarean Birth**

The relatively sudden rise in cesarean births over the last three decades
has caused concern among policy analysts, clinicians, and researchers. Part
of the rise has been blamed on the increased use of electronic fetal heart rate
monitoring. Not long ago, the appearance of even a single late deceleration
was alarming to clinicians who rushed to surgery to save what they thought
was a severely compromised fetus. In observing the environment of the
delivery area at MHW, the tenor has changed. Fetal heart rate aberrations
are watched carefully, but the parturient is given every chance to deliver the
neonate vaginally. Four of the subjects in the study had both the vacuum
suction applied for delivery assistance, and then the forceps. One finally went
to surgery after both had failed. MacDonald Hospital for Women (MHW) appears to be close to a 15% cesarean rate, a goal set by the United States Department of Health and Human Services (USDHHS, 1990). However, not all acute care institutions with maternity services may have moved so quickly to meet government guidelines. In another institution, the cesarean birth rate may have been higher and the findings different. In the discriminant analysis, NODI was a strong competitor to HLOL. While the scene is changing for cesarean birth, NODI cannot be ruled out as a potential predictor for cesarean birth. For reasons of increased cost and morbidity, cesarean birth is an important outcome variable. and should be included in any future research with this independent variable.

Historically, it appears that hospitals and care providers became serious about reducing the cesarean birth rate after the federal government set guidelines. Unfortunately, the Office of Health Technology Assessment evaluates only new and unestablished medical technologies or those under consideration for federally funded programs (USDHHS, 1994a). While the Federal Drug Administration wields great power over approval for the marketing of new pharmaceuticals and medical devices, it does not prescribe their appropriate use. This is left to the users of the technology. The cost effectiveness of an intervention relative to outcome may be of greater interest to third party payers, and eventually the federal government, depending on
the degree to which responsibility for health care becomes federally directed (Sisk, 1993). At a time in history when complex technology is an attractive aid to many tasks, perhaps more attention and resources need to be diverted to monitoring technology for the protection of the health of citizens, particularly those that are young, vulnerable, or in the childbearing years.

**Physiological Distress**

The components of physiological distress were analyzed to determine their validity as correlates of NODI. The components remaining in the equation were intrapartum fever, dysfunctional labor, and maternal exhaustion. Miscellaneous distress was eliminated as a significant contributor to the construct.

**Pain management**

Pain management had a large amount of missing data and was not analyzed as part of this construct. However, because of its importance as a contributor to maternal comfort levels, this component should not be abandoned as a component of this construct. Pain is a complex concept that may need a more defined focus for study. In future research, chart data may not be the appropriate source for this data. Chart data may not represent accurately the parturient's pain, but rather the nurse's interpretation of that pain and inclination to record it in the hospital record.
Miscellaneous distress

The component of miscellaneous distress was a grouping of minor and major distressing signs and symptoms that occurred only occasionally to parturients so an aggregate of symptoms was used for this variable. The charted signs or symptoms that contributed to this variable are nausea, vomiting, hypertension, anxiety, ketonuria, hunger, chills, shaking, itching, dizziness, sensation loss, perineal swelling, intravenous infiltration, heartburn, gogginess from sedative, eye irritation, and vagal response.

Intrapartum fever

Fever may be a physiological reaction to the stress of labor; a sign of infection or dehydration; an idiosyncratic reaction to drugs; or a condition directly related to the practice of encouraging or proscribing nourishment during labor (Johnson, Keirse, Enkin, & Chalmers, 1989). Infection may be secondary to frequent use of vaginal exams during labor and to traumatic intervention such as internal uterine and fetal monitoring, episiotomy, artificial rupture of membranes, forceps, vacuum extraction, and cesarean birth (Enkin, Enkin, Chalmers, & Hemminki, 1989). More recently, fever during labor and immediately postpartum has been associated with the use of epidural pain management (Kennell et al., 1991b; Macaulay, Bond, & Steer, 1992). This area appears to be receiving some research attention as
clinicians become more aware of the hazards that may accompany epidural pain management.

**Dysfunctional labor**

Dysfunctional labor is expressed by prolonged labor, arrest of labor, ineffectual contraction pattern during labor, or hyperstimulation of labor. Dysfunctional labor can be the outcome of inappropriately timed analgesia or anesthesia giving it direct correspondence to an invasive intervention. Prolonged dysfunctional labor leads to maternal exhaustion.

**Maternal exhaustion**

Maternal exhaustion, like pain, is a subjective component. Some women may have more tolerance than others for sustaining energy and optimism during a protracted labor. The contribution of the parturient's support system, both personal and professional may be pivotal in her endurance. Maternal exhaustion is an important component to the construct because these parturients often have an assisted delivery.

Little research has been done on the components of physiological distress during intrapartum. Only parturition pain has received research attention. This construct warrants future study.
Control Variables

Hospital Length of Labor

While the purported total length of labor was reported on each subject's hospital record, the variable of interest here was the hospital length of labor (HLOL) since it was not until the woman was triaged for labor that interventions began. Hospital length of labor has potential for being a confounding variable with NODI. The threat was that the longer the parturient was in the hospital the more invasive interventions she may have simply because care providers may need to appear that they were doing something for her benefit, or they may have been insecure about the length of time dilation was taking, did multiple vaginal exams to see if any progress had occurred yet, and ultimately initiated pharmacological labor augmentation. Many U.S. institutions now follow the protocol for active management of labor in which dilation must occur at a prescribed and even pace or oxytocin augmentation is initiated. Therefore, a short length of labor may indicate a vigorous use of invasive and unphysiologic interventions to speed labor, such as amniotomy, intravenous administration of oxytocic drugs, episiotomy, vacuum extraction, and forceps.

Longer hospital length of labor as a control variable was a significant predictor of NODI for lower Apgar score and increased fetal stress reactivity, and was the single remaining predictor for cesarean birth. Future research to
explore the nature of the relationship of NODI, hospital length of labor, and parity as interrelated variables is warranted.

**Epidural Analgesia and Anesthesia**

In Chapter 1 of this dissertation, a model algorithm proposed that epidural as a choice for pain management had the potential of precipitating a cascade of intervention. Assumptions were made that an initial choice for invasive technology committed the care provider to a management plan in which increasingly invasive technology was required, and the greater the number of invasive interventions, the less favorable the outcomes were for mother and neonate.

The descriptive data comparing an epidural subset of subjects with a no epidural subset indicated longer labors, more invasive interventions, and lower Apgar and higher Hobel scores when epidural was the pain management choice. The obvious conclusion was that the choice of an epidural precipitates a cascade of invasive interventions leading to unfavorable outcomes for many women, though not all. Because other invasive technology, such as that often implemented for induction of labor, was controlled by the selection criteria, no other clinical management technology demonstrated this phenomenon.

However, in the concluding analyses, epidural pain management was not a variable that competed with NODI as an explanation for the findings.
Others (Kennell et al., 1991b) found epidural anesthesia demonstrated a significant ($p < .01$) association with cesarean birth; forceps deliveries; use of oxytocin and narcotic analgesia; and the conditions of prolonged second stage, failure to progress, and longer labors. Epidural procedure for labor pain management is a component of NODI. As the independent variable, NODI, is refined, the relative importance of the epidural procedure may change.

**Care Providers**

The literature supports the expectation that invasive interventions will be fewer and outcomes will be more favorable if the parturient is attended by a nurse-midwife rather than by an obstetrician or family practitioner. Like Morris et al. (1993) and Fullerton et al. (1990), the nurse-midwife managed labors and births did not stand out as being significantly different in this hospital-based study. The obstetricians and family practitioners in private practice used more invasive interventions and were significantly different from the other groups. The residents' style of practice was very close to that of the nurse-midwives; the mean number of invasive interventions for labor management were 7.50 and 7.49, respectively.

Referring again to Table 29, this comparison appears to support Fullerton's (1992), Morris' (1993), and now Kvale's, conclusions that the hospital setting and/or aggregate peer group appear to dictate the acceptable
practice style for that particular environment. Apparently, the influence of philosophically less interventionist nurse-midwives moderates to a limited extent, the number of interventions in some hospital settings. There are plausible explanations for this observation in this research.

1. Nurse-midwives may not experience full autonomy in the hospital setting. Field notes taken by research observers for the validation sample in the Kvale research, indicate that when the nurse-midwives are managing clinic patients’ labors, the nurses in the unit implement a routine protocol without waiting for the nurse-midwife to issue directions. When nurse-midwives manage the labors of their own private patients, they have autonomy over the protocols implemented. This lack of management authority for clinic patients means that the nurse-midwives may attend a higher number of patients with epidural analgesia, oxytocin augmentation, internal monitoring, and other invasive interventions than they might choose.

2. Parturient preference may be a factor in this environment for the type and number of interventions. Women select their care provider sometimes based on shared philosophies. Others have set notions, usually reflecting those of society in general, about what is the "best" care. This may be equated with a tertiary care center with a physician subspecialist and complex technology.
3. The residents may be practicing technology learned from the CNMs. Both staff and private nurse-midwives have as one of their designated functions at MHW supervision of medical students and often residents in managing low risk labor and delivery. The obstetric and family practice residents are still learners and certified nurse-midwives provide some of the role modeling to which they are exposed. The physicians in private practice may represent an older cohort that was not exposed to a noninterventionist style of practice in formative years of practice. In addition, private practice physicians may be more likely to respond to the demands of their paying customers.

4. The findings may represent inequity in NODI as an outcome of economic status rather than care provider discipline. The MHW data indicate that private patients receive on the average three more interventions per labor than the Medicaid patients. There may be inequity in the type and degree of technology that private and public consumers receive. If so, these data did not express that inequity clearly. Field observers noted that obstetric and family practice residents tended to be managers of care for clinic patients. These women, whose bill was financed by Medicaid, tended to be poor and African American.

5. The findings may be misleading due to the small number of CNM-attended labors (n = 14).
Summarizing from these data and from the literature, apparently nurse-midwives do not have full autonomy in a hospital environment. The hospital environment seems to reduce practice styles close to a standard level, though exceptions that have surmounted institutional bureaucracy have been documented (Haire & Elsberry, 1991; Wingeier, Bloch, & Kvale, 1989). In order for nurse-midwives to demonstrate a noninterventionist practice style, they need an environment that supports that style, such as a birth center or an exceptional hospital environment. The effect of the institutional climate on the style of practice may work in reverse also. In the Rooks et al. study (1992a,b,c), the care providers at the 89 birth centers included physicians.

Conclusions

The following conclusions for low risk parturients from this research at a tertiary care university hospital in a large Midwestern city are offered.

1. The independent variable, NODI, demonstrated potential as a valid predictor of parturient and neonatal morbidity.

2. A greater NODI experienced by the parturient or fetus during low risk labor and birth was associated with lower one minute Apgar scores and more morbidity, as measured with the Hobel neonate morbidity scores.

3. A greater NODI experienced by the parturient or fetus was associated with more fetal stress reactivity and more parturient distress.
4. The above conclusions were valid even when controlled for type of care provider, method of pain management, ethnicity, parity, and occupation.

5. Hospital length of labor (HLOL) was a significant predictor of higher Hobel scores, increased physiological distress, and occurrence of cesarean birth.

6. There was a significant difference between the mean number of different invasive interventions prescribed by private physicians and those prescribed by resident physicians and certified nurse-midwives, groups that had fewer.

7. Parturients with cesarean births experienced a significantly greater NODI than parturients with vaginal births. However, HLOL presented a competing hypothesis for this finding.

Limitations

Several sources of error that could bias the findings were examined. This is the first study of this new measure. While promising, the measure was a crude one that did not weight the interventions by degree of invasiveness. The relationships of the independent variable to the outcome variables could strengthen or weaken with refinement of the variable.

Although the hospital records were reasonably complete and accurate when compared with observers' records, not all the data in the records were accurate, and sometimes care providers forgot to document events. Despite
the care that was taken to insure accuracy and consistency in abstracting, coding, cleaning, and entering data, error can occur. Some data were missing for some of the variables, though the total number of cases in each instance was reduced by just a few.

Any research findings should be regarded with caution, until replicated and affirmed. This research was confined to the culture of one institution. Research into the outcomes from the type and number of interventions occurring in other cultures, at other hospitals, birth centers, and for home births should continue; replication research in different settings would offer comparison data.

Implications for Health Care

Childbirth is a developmental event that is stressful both psychologically and physiologically. A glance at lay publications gives ample indication of the importance of this experience to the well-being of the woman and the family (e.g., Rosenberg, 1993). Using a questionnaire survey of a convenience sample (n = 159), Simkin (1986) found the most stressful events during hospitalized labor and birth to be pitocin induction or augmentation of labor, administration of anesthesia, restriction to bed, restriction of movement in bed, forceps and vacuum extraction of neonate, limited time with the baby, and circumcision.
Some stress in labor can have a beneficial effect in producing catecholamines which physiologically prepare the parturient and fetus for birth and extrauterine adaptation. Stress to the point of distress, on the other hand, can be deleterious to both parturient and fetus. Advocates of an active style of management would reduce stress and avoid distress with pharmacological manipulation, an intervention which would reduce circulating catecholamines. Simkin postulates that the subsequent reduction in catecholamines from narcotics is unphysiological and counterproductive. Furthermore, the drugs cross the placenta readily and depress fetal brain metabolism.

Effects from single drugs are documented in professional literature; documenting the effects on the parturient and the fetus from combinations of different doses of drugs interacting with naturally occurring hormones during childbirth is more difficult. Outcomes may be different when the body has to deal with a chemical cascade in addition to the normal physiology of labor. The impact of the chemicals used to control the timing of labor and provide pain management cannot be discarded as a probable source of morbidity. The problem is complicated by the fact that there are two clients receiving each intervention. There is no safe chemical for the birthplace; only chemicals that are less hazardous than others. Research on the safety and side effects of pharmacotherapeutics for the birthplace needs to continue.
Observers' field notes in this research document women asking, and sometimes demanding, their epidural. A future issue for research might be the influence of childbirth education in women's choice for pain management. Of the women who did not have an epidural, 26 (53%) had taken childbirth education classes.

Strand, Beckwith, Chronwall, and Sandman (1994) claim that identification of the release pattern of beta-endorphin and adrenocorticotropic hormone in third trimester may predict women who will require epidural pain management during labor. Obviously, pain management during parturition continues to be a fertile area for research with childbirth education history, cultural overlay (Haire, 1972; Haire, 1976), care provider choice, and body chemistry possibly contributing to the selection and success of pain management strategies.

Implications for Nursing

Nurses are the primary managers of the environment of the birthplace. They control how and what information is communicated to patients, physicians, and nurse-midwives in the birthplace. Their influence is pivotal in providing a quality of care that protects the safety of the parturient and fetus, insures within reason the low risk family's expected birth experience, and portends a comfortable and quick post-birth recovery.
The institutional philosophy at MHW, as indicated by intervention use, resembles the pattern of active management of labor as espoused by Boylan (1989) and McDonald (1990). While acknowledging that an active style of management may be advantageous for a minority of parturients with compromised pregnancies, the rigidity with which the protocols are applied to low risk women is disturbing. Nurses have the expertise, power, and bedside vantage point within the birthplace to moderate that trend.

With awareness of the transient responses and prolonged sequelae of fetal stress reactivity and physiological distress during labor and birth, birth room nurses can devise better nursing technology to provide relief and comfort. This may mean foregoing some of the machinery and returning the birthplace to an environment of human interaction as opposed to scrutinizing monitors and adjusting dials. Nurses need to take pride in and regain confidence in their skills of assessment and in their clinical judgment. The birthplace is appropriately a high-touch environment, and the best intervention to provide safety, comfort, and timeliness is the active and physical involvement of nurses palpating the strength of contractions, using their ears to listen to the fetal heart beat, encouraging position change and ambulation to stimulate labor, and innovating ways to relieve pain that are noninvasive. Family physicians were advised, "Perinatal outcome depends on . . . skill rather than on technology" (Chaska, Mellstrom, Grambsch, & Nesse, 1988, p.
161). The same advice is appropriate for nurses in the birthplace (Hodnett & Osborn, 1989; Kennell, Klaus, McGrath, Robertson, & Hinkley, 1991a; Sosa et al, 1980).

When comparing the validation sample with the study sample for this research, charting was sometimes compulsively complete and retrievable, and at other times, recorded in unusual places or not at all. Particularly noted was a nonchalance in recording the number of vaginal exams. Precise records of each intervention and the parturient's response benefits care when trying to relate outcomes to the interventions experienced. Clinicians, researchers, and patients will benefit from complete and accurate records. Undoubtedly, the extant situation dictates the attention the nurse has to give charting in any one particular instance. Nevertheless, consistency was lacking. Hospital charts, in the era of quality assurance and Joint Commission of the American Association of Hospitals reviews, have become voluminous with multiple places requiring the same data. There is a danger also that the record will require so much attention (along with the machines), that hands-on nursing care will suffer. This is diametrically opposite of where the priority should be.

The nurse's influence extends beyond the birthplace. Nurses have contact with pregnant women socially and professionally in their roles as home visiting and public health nurses, childbirth educators, advanced
practice nurses in ambulatory care, as well as managers of the birthplace environment. Their awareness of the subtle morbidity that attends both particular and cumulative invasive interventions should be a catalyst for accurately informing women of their choices in birth care and the potential outcomes. Nurses are keenly aware that every intervention for the parturient also affects the fetus. They can be better advocates for noninvasive and healthy care for women and babies amidst the current milieu of technological fascination and exploitation.

Further Research

Throughout the discussion of the findings, areas for future research have been pointed out. These include refining NODI by weighting the interventions according to invasiveness, developing an index of invasiveness which would incorporate the weights, refining the constructs of fetal stress reactivity and physiological distress, and designing a more varied sample. In addition, the data base from this research offers a foundation for follow-up study in the following areas:

1. The PI and research assistants during the pilot studies and observation phase of this study made comprehensive field notes. A content analysis of the field notes in tandem with the chart audit will enrich the quantitative conclusions from this research and add additional insight into the culture of care at this hospital-based service.
2. The data base has been preserved in a fashion that allows chronological analysis. A secondary analysis of the data base relative to the timing of interventions and subsequent responses may add more detail to the findings from this research. These data could be explored to a fuller extent.

3. Some data were collected that could not be used. An example is data on restriction of oral intake during labor. This was an intervention selected by Morris et al (1993) that had been intended for this research also. It became clear early in data collection that no parturient in this service received oral sustenance beyond ice chips, water, and occasionally clear liquids. Data to support documentation of nourishment for labor was the time and amount of last food before admission - information recorded in nursing admission notes. These data warrant exploration as a base for another study of oral intake prior to and during labor. Additionally, exploring the data base on postpartum discomfort in the first 24 hours or in the neonate's ability to feed, may also reveal insights into the impact of invasive interventions (Kennell, 1994; Rigard & Alade, 1990; Widstrom, 1987).

4. Appropriate technology for the birthplace is the broad topical area under which this research falls. Appropriate technology in health care is a topic of international concern. Developing countries look to the United States as leaders in health care. They are eager to import our technology, and there are well meaning health care and governmental agencies eager to
disseminate new technology if it can be sold, or to donate technology outdated for this culture. Research into the birthplace technology already in place and functioning well in the developing country would contribute to preventing inappropriate technology from being imported.

5. A cost analysis of a low intervention parturient model contrasted with a high intervention parturient model from this study would be of interest to health policy analysts.

6. Examine the data base for possible interactions. While true statistical interactions are rare\textsuperscript{1}, a potential for interaction was noted in this data in two areas. First, parity and length of labor may provide opportunity for interaction. That first labors usually are longer than subsequent labors is common knowledge. Second, there may be an interaction between care providers, ethnicity, and payer. The descriptive data indicated that obstetrical residents were responsible for the MHW obstetric clinic (Medicaid) patients, who were mostly African American.

7. Investigate the influence of the primary nurse on the number and type on interventions the parturient experiences. During field observation, some nurses were observed to be very active with nursing measures to provide comfort while others merely offered to call for an epidural.

\textsuperscript{1}S. Zyzanski.
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APPENDIX A

Glossary of Conceptual and Operational Definitions

Caregiver or care provider A credentialed professional who is prepared to render expertise and skill during the process of labor and birth.

Fetal stress reactivity Fetal stress reactivity is a construct defined as occurrence of meconium staining or episodes of variable or late fetal heart rate decelerations, bradycardia, tachycardia, or changes in variability after the onset of labor and admission to the labor and delivery unit.

Intervention An object or action that modifies or mediates something else. An intervention that is invasive in some measure is one that immediately or over time destabilizes normal intrapartum or postpartum physiological function in some way. The intervention may cause a) pain or discomfort unrelated to or excessive for labor; b) unphysiologic side effects; and/or c) additional risk to the parturient or fetus.

Intervention, corrective Those interventions introduced for the purpose of correcting a perceived threat to the health of the woman or fetus.

Intervention, supportive Those interventions which support the physiological evolvement of the process of labor while providing comfort and facilitating a timely labor and birth.

Intervention, preventive Any supportive or corrective intervention which is introduced with the intent of preventing an unfavorable outcome.
Low risk  Low risk in this research referred to those women who were admitted to the labor and delivery unit, examined by a professional care provider and found to be healthy with no unresolved antepartal complications. The care provider declared them without risk or low risk and anticipates a normal, spontaneous birth.

Morbidity  Episodes of fever or infection; excessive pain; fatigue and exhaustion; and anxiety, depression or irritability of the parturient during intrapartum or immediately postpartum. Encompassed in the construct, physiological distress. For the neonate, morbidity was measured by the Hobel neonatal morbidity score (Appendix D). Encompassed in the construct, fetal stress reactivity.

Natural Childbirth  The various definitions of natural childbirth range from birth with no interventions at all to anything short of cesarean birth. At MacDonald Hospital for Women, the term seemed to indicate a normal, spontaneous vaginal delivery without epidural analgesia or anesthesia.

Normalcy  The state of anticipated physiological evolution of labor and birth, with unique variations that are acceptable as long as maternal and fetal cues are reassuring.

Physiological distress  For the parturient, the construct, physiological distress, is chart notation of signs or symptoms of fever (oral temperature exceeding 37.5 C.), failure of pain control method, dysfunctional labor, and other
distress such as itching, nausea, vomiting, maternal exhaustion, hypertension, hypotension, and so forth.

Parity, grand multipara A parturient of six or more previous viable pregnancies (Miller & Keane, 1987).

Parity, multipara A parturient of two or more viable pregnancies (Miller & Keane, 1987).

Parity, primipara A parturient of the first viable pregnancy and birth (Miller & Keane, 1987).

Practice style The decision-making response of the caregiver to the perception and interpretation of cues during a caregiving event. The process is covert and is observed externally by the interventions implemented. Operationally defined, practice style has three distinct elements in its conceptual structure - type, timing, and application of interventions. Type refers to the degree of invasiveness of the intervention. Interventions range from low invasiveness (nonverbal, nontactile) to high invasiveness (deep body penetration). The type that a caregiver selects and the frequency with which that intervention is implemented distinguishes practice style. Timing refers to the frequency with which interventions are implemented. Application is the intent or rationale behind the use of an intervention, i.e., preventive, supportive, or corrective.
Practice style, interventionist  Anticipates the pathological potential of pregnancy and birth, and intervenes quickly and, if necessary, invasively to prevent and correct perceived disaster. Driving concept nd schema is the biomedical model.

Practice style, noninterventionist  Places trust in female physiology to unfold within the boundaries of normalcy, anticipates a favorable outcome, and uses interventions that do not interrupt the physiological normalcy of pregnancy and birth; a reluctance to intervene in a manner contrary to the physiological norms and the natural developmental process of labor and birth. Driving concept and schema is normalcy and movement toward health.

Schema  A pattern of associations, mental set, or cognitive network expressing past experiences and education, a sum of the individual’s knowledge about something, in a specialty area guides the perception and processing of incoming data and allows the individual to make judgments quickly; part of the socialization process in any professional discipline (Richards, 1982). Includes the balance of values, beliefs and accumulated knowledge of the discipline that predispose a set response to similar experiences.

Technology  The method or process used to apply scientific (and sometimes traditional) knowledge. Also the sum of ways in which care is provided.
APPENDIX B
APPENDIX B

A Typology of Labor Interventions

**External/Noninvasive/Physiologic**

**Type 1 - Nonphysical interventions**
- Presence
- Reassurance
- Breathing techniques
- Relaxation techniques
- Imagery
- Coaching
- Education
- Counting respirations
- Timing contractions
- Observation
- Therapeutic touch technique

**Type 1 or 2 - Positional interventions**
- On back, flat
- On back, head raised
- Fowler's position
- Sitting
- Squatting
- Ambulation
- Bedrest
- Lying on side
- Trendelenburg
- Hands and knees
- Knee-chest
- Change of position
- Posturing

**Type 2 - Applied to skin, touch is involved**
- Water (Tub, shower, jacuzzi)
- Communicative touch
- Compresses
- Check bladder
- Counting pulse
- Blood pressure measurement
Vital signs by electronic monitor
Abdominal palpation
Palpate contractions
FHR by fetoscope
Kissing
Back counterpressure
Perineal support
Palpate for placental separation
Effleurage
Massage
TENS

**Type 3 - Manipulative interventions**
Abdominal lifting
Acupressure
Nipple stimulation
Orgasm
"Rimming" the perineum
Ritgen maneuver
Abdominal decompression

**Type 4 - Internal Physiologic**
Food/fluids/herbal teas
Oral temperature

**Internal/Invasive**

**Type 5 - Preserving skin integrity**
Speculum exam
Enema
Rupture of membranes (amniotomy)
Strip membranes
Amniotomy or slip an anterior lip
Forceps
Vacuum extraction
External version
Rectal temperature
Vaginal examination
Type 6 - With instrumentation/manipulation
Systemic drugs
Electronic fetal monitoring (EFM) by doppler
Ultrasound
X-ray

Type 7 - With skin penetration
Acupuncture
Internal electronic fetal monitoring (fetal scalp electrodes or FSE)
Fetal scalp blood sampling
Parenteral drugs
Intravenous therapy
Epidural/spinal anesthesia (a combination of intervention types)
Local anesthesia (local infiltration, paracervical block, pudendal block - all combinations of intervention types)
Acupuncture

Type 8 - Deep body invasion
Internal uterine monitor (Intrauterine pressure catheter or IUPC)
Amnioinfusion
Manual removal of placenta
Uterine exploration
Catheterization of the bladder
Definition and Description of Terms for
Selected Categories and Interventions

Type 5 - Preserving skin integrity. Type 5 interventions invade the body in some way but skin integrity is preserved.

Vaginal examination - The caregiver places hand in the vagina to assess dilation, effacement, station, and position.

Speculum exam - The caregiver uses a vaginal speculum in the vagina to visualize the cervix.

Amniotomy - The caregiver ruptures the amniotic membranes to release the liquor.

Cervical manipulation or "Slip an anterior lip" - The caregiver places the forefinger under the anterior rim of the dilating cervix, asks the parturient to bear down while the rim of the cervix is slipped back over the occiput to effect complete dilatation.

Vacuum extraction - The instrument is applied transvaginally to the fetal vertex during second stage.

Forceps - Forceps are introduced transvaginally and placed on either side of the fetal presenting part. Usually done by a physician, though decision to apply forceps may be initiated by nurse-midwife.
Type 6 - With instrumentation/manipulation. The touch employed in type 6 interventions is more invasive, may cause pain, and often uses an instrument.

Systemic drugs - The caregiver administers oral or topical drugs for a systemic effect.

Electronic Fetal Monitoring (EFM) by doppler - The caregiver assesses fetal heart sounds by sound waves directed toward the fetal heart.

Type 7 - With skin penetration. Skin integrity is impaired to some degree and pain is inflicted.

Episiotomy - A median or mediolateral incision is made in the perineum prior to the delivery of the occiput.

Internal Fetal Scalp Electrode - The monitor electrode is attached to the fetal scalp by means of a clip or screw.

Parenteral drugs - Drugs are administered subcutaneously, intramuscularly, or intravenously.

Intravenous therapy - Nourishment, electrolytes, and fluid is administered into the vein the parturient.

Type 8 - Deep body invasion. Skin integrity may or may not be impaired. The body may experience deep invasion into a body cavity, the procedure is painful, blood may be lost.
Intrauterine pressure catheter monitor - A pressure catheter is inserted transvaginally between the amniotic sac and the inner uterine wall to measure strength of contractions.

Amnioinfusion - Normal saline solution in introduced into the uterus via an intrauterine catheter for the purpose of replacing amniotic fluid after the membranes have ruptured. It is a corrective intervention for deep and threatening fetal heart rate decelerations.

Manual removal - During third stage of labor, the caregiver's hand is introduced into the uterus and slipped under the placenta to separate it from the uterine wall and lift it out.

Uterine Exploration - Care provider manually palpates the interior walls of the uterus, presumably seeking placental remnants or rupture of the uterine wall.

Catheterization of bladder - a flexible catheter is passed through the urethra into the bladder to release urine when patient is unable to void or in preparation for surgery.
APPENDIX C
Assignment Objective

Have nurses suggest patients with high interventions and low interventions. Review these charts to see if this "tool" works in discriminating between High and Low labor intervention categorization.

Question asked stated same way each time

"Could you direct me to the charts of two patients who you would judge to have a lot of interventions during labor, and to two who didn't have very many?"

Context

Four nurses on post partum were asked at three different times: first, of the daytime charge nurse, second of the clinical nursing instructor from Kent State University, who had gone over the census when assigning her students, and finally, the evening charge and one other nurse at the station. This gave a selection of patients to choose from (only one appeared on two different lists). I eliminated those who would not otherwise have met my criteria for study admission. I did not use any who were at risk to begin with (as twins), with the possible exception of one who was admitted Premature Rupture Of Membranes (PROM) and finally got pitocin induced (subject 5).

As the nurses thought about who to select, they had a tendency to focus on the outcome - as in "she bled a lot" - to identify the high intervention subjects. They appeared to think of intrapartum events that would require interventions,
rather than the other way around. The evening nurses who suggested subject 5 because they were impressed with the experience of falling in the bathroom and lacerating her head, as causing increased intervention during labor. The daytime charge nurse said that the post partum nurses were not always aware of how many interventions a patient had during labor; that it may be better to ask labor and delivery nurses. I chose not to do this because the labor and delivery nurse who was working when the patients were in may not now be there nor might they remember what happened well without a chart to remind them, especially if the labor was uneventful with few interventions. All of the nurses seemed to have trouble thinking of anyone with a high number of interventions. This suggests to me, that their standard of what constitutes interventions may not be congruent with mine. All of the subjects were low risk at time of admission to labor.

From the charts

This time, I was impressed that there was missing data, and some inconsistencies that required my judgment to call. Last time I did this I used the "pulled together" record after discharge. This time I used solely the L&D record. Suggests I should use chart audit after discharge for data collection.

Discussion

While I do not agree with how the postpartum nurses classified at least one of the patients (thinking clinically), the means of the Low group and the High
group appear to differ when weighted. As shown in Figure 2, means were calculated for the total sample, the High group (N=2) and the Low group (N=2) using both the total length of labor (TLOL) and the length of labor while in the hospital (HLOL). The latter is the logical choice since few if any interventions would occur prior to the time of hospital admission. Figure 1 depicts means calculated three other ways - a) when interventions were not weighted; b) with weights from 1-4 when anything that combined two categories of intervention (such as local infiltration) received a single weight for the highest category represented; and c) with complex interventions incorporating more than one category of intervention, the scores for each category being additive. Analyzing the data in several different ways suggests which way may be the most sensitive to actual differences.

The most sensitive way to look at this data appears to be when HLOL is used to control for length of labor, if combination interventions are scored categorically, the mean number of interventions per hour of labor is 9.95 for the Low group and 13.2 for the High group, a difference of 3.25. Though I did not statistically analyze this, there appears to be some difference. Excluding Subject # 5, the difference may be greater to the point of statistical significance.

Suggesting validity for doing a study of this type is the outcome data also observed (Figure 3). Subjects 1 and 2, with the lowest intervention scores, had no adverse outcomes during labor. Subject 5, also ranked Low by the
postpartum nurses, received pitocin induction and an epidural, demonstrated some Fetal Stress Reactivity and hyperstimulation of the uterus. Subject 3, with the highest intervention scores, had multiple interventions culminating in a cesarean birth for asynclitic presentation. Subject 4, who the postpartum nurses ranked as Low, became disoriented during her labor and fell in the bathroom lacerating her brow. Repair was required. Both Subjects 3 and 4 experienced adverse reactions to their epidurals - subject 3 experienced intense itching which persisted through 11 hours of labor and subject 4 demonstrated fever, a documented side effect of epidural anesthesia. Four of 5 subjects had epidurals. The attending care provider for each was a physician.
Table 1C. **Nurses’ Rating, Length of Labor, and Raw Scores with and without Weights. N = 5.**

<table>
<thead>
<tr>
<th>subject #</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Mean Low</th>
<th>Mean High</th>
<th>Mean Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses’ rating</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Total</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Total LOL¹</td>
<td>6</td>
<td>7</td>
<td>32</td>
<td>23</td>
<td>12</td>
<td>16</td>
<td>8.3</td>
<td>27.5</td>
</tr>
<tr>
<td>Hospital LOL²</td>
<td>4</td>
<td>4</td>
<td>27</td>
<td>12</td>
<td>12</td>
<td>11.8</td>
<td>6.7</td>
<td>19.5</td>
</tr>
<tr>
<td>Raw score s wt³</td>
<td>11</td>
<td>8</td>
<td>122</td>
<td>32</td>
<td>48</td>
<td>44.2</td>
<td>22.3</td>
<td>77.0</td>
</tr>
<tr>
<td>Raw score c 1-4⁴</td>
<td>25</td>
<td>27</td>
<td>330</td>
<td>111</td>
<td>144</td>
<td>127.4</td>
<td>65.3</td>
<td>221.0</td>
</tr>
<tr>
<td>Raw score c com.⁵</td>
<td>25</td>
<td>34</td>
<td>407</td>
<td>136</td>
<td>181</td>
<td>156.6</td>
<td>80.0</td>
<td>272.0</td>
</tr>
</tbody>
</table>

¹ Total length of labor (TLOL). Length of labor from the time subject indicated by history that labor started at home.

² Hospital length of labor (HLOL). Length of labor calculated from the time subject was admitted and when the interventions would have begun. For continuous interventions, one hour was counted after subject had been here one hour and then for each fraction of an hour thereafter.

³ Raw score number of interventions with no weights. Intervention was present or absent. For continuous interventions, this does not take into account the time over which the intervention was present - only that it was there once.

⁴ Raw score with weights from 1 to 4, corresponding to the typology of intervention, invasive section. Each intervention that combines the four categories (unphysiologic, systemic, manipulation/penetration, breaks skin barrier) received the highest weight of 4.

⁵ Raw score with a different weighting scheme. Each intervention that combined categories received a score for each category which was additive for every hour of time continuously present (such as epidural) and additive by occurrence if episodic intervention (such as vaginal exam).
Table 2C. **Subjects' mean number of interventions, nurses' ratings, total length of labor, hospital length of labor, and mean totals.**

<table>
<thead>
<tr>
<th>Subject #</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses' rating</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Total</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Mean s wt TLOL</td>
<td>1.8</td>
<td>1.14</td>
<td>3.8</td>
<td>1.39</td>
<td>4</td>
<td>2.43</td>
<td>2.31</td>
<td>2.6</td>
</tr>
<tr>
<td>Mean s wt HLOL</td>
<td>2.75</td>
<td>2.0</td>
<td>4.5</td>
<td>2.67</td>
<td>4.0</td>
<td>3.2</td>
<td>2.9</td>
<td>3.6</td>
</tr>
<tr>
<td>Mean c 1-4 TLOL</td>
<td>4.2</td>
<td>3.86</td>
<td>10.3</td>
<td>4.83</td>
<td>12</td>
<td>7.04</td>
<td>6.7</td>
<td>7.6</td>
</tr>
<tr>
<td>Mean c 1-4 HLOL</td>
<td>6.25</td>
<td>6.75</td>
<td>12.2</td>
<td>9.25</td>
<td>12</td>
<td>9.29</td>
<td>8.3</td>
<td>10.7</td>
</tr>
<tr>
<td>Mean c com TLOL</td>
<td>4.17</td>
<td>4.86</td>
<td>12.7</td>
<td>5.9</td>
<td>15.1</td>
<td>8.55</td>
<td>8.04</td>
<td>9.3</td>
</tr>
<tr>
<td>Mean c com HLOL</td>
<td>6.25</td>
<td>8.5</td>
<td>15.1</td>
<td>11.3</td>
<td>15.1</td>
<td>11.2</td>
<td>9.95</td>
<td>13.2</td>
</tr>
</tbody>
</table>

Table 3C. **Outcomes During Labor**

<table>
<thead>
<tr>
<th>Subject #</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses' rating</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Parturient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Emesis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X3</td>
</tr>
<tr>
<td>Itching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11 hrs</td>
</tr>
<tr>
<td>Accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Hyperstimulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Perineal laceration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Cesarean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Fetus**

| Early decelerations | X 1 |
| Variable decelerations | X 4 |
| Altered baseline FHR | X 1 |

---

\(^6\) Means were used to control for length of labor as a causative factor for higher number of interventions.
APPENDIX D
### APPENDIX D
Apgar Score*

<table>
<thead>
<tr>
<th>Sign</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td>Absent</td>
<td>Below 100</td>
<td>Over 100</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Absent</td>
<td>Weak cry</td>
<td>Strong cry or respiratory effort</td>
</tr>
<tr>
<td>Effort</td>
<td>Hypoventilation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle Tone</td>
<td>No response</td>
<td>Some flexion of</td>
<td>Well flexed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>extremities</td>
<td></td>
</tr>
<tr>
<td>Reflex Irritability</td>
<td>No response</td>
<td>Grimace</td>
<td>Cough, sneeze, or cry</td>
</tr>
<tr>
<td>Color</td>
<td>Blue, pale</td>
<td>Body pink,</td>
<td>Completely pink</td>
</tr>
<tr>
<td></td>
<td></td>
<td>extremities blue</td>
<td></td>
</tr>
</tbody>
</table>

*Adapted from Apgar, 1953 and Varney, 1987.
# APPENDIX D

## SCORING HOBEL

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>WEIGHT</th>
<th>FACTOR</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2000 Gms</td>
<td>10</td>
<td>RDS</td>
<td>10</td>
</tr>
<tr>
<td>Apgar 5 = &lt;5</td>
<td>10</td>
<td>Meconium aspiration syndrome</td>
<td>10</td>
</tr>
<tr>
<td>Resuscitated at birth</td>
<td>10</td>
<td>Congenital pneumonia</td>
<td>10</td>
</tr>
<tr>
<td>Fetal anomaly</td>
<td>10</td>
<td>Resp. syst. anomalies</td>
<td>10</td>
</tr>
<tr>
<td>Dysmaturity</td>
<td>5</td>
<td>Apnea</td>
<td>10</td>
</tr>
<tr>
<td>2000-2500 Gms</td>
<td>5</td>
<td>Other resp. distress</td>
<td>10</td>
</tr>
<tr>
<td>Apgar 1 = &lt;5</td>
<td>5</td>
<td>Transient tachypnea</td>
<td>5</td>
</tr>
<tr>
<td>Feeding problem</td>
<td>1</td>
<td>CNS depression &gt; 24 hours</td>
<td>10</td>
</tr>
<tr>
<td>Multiple birth</td>
<td>1</td>
<td>Seizures</td>
<td>10</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>10</td>
<td>CNS depression &lt; 24 hours</td>
<td>5</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td>10</td>
<td>Major cardiac anomaly with immediate cath.</td>
<td>10</td>
</tr>
<tr>
<td>Hypo/hypermagnesemia</td>
<td>5</td>
<td>CHF</td>
<td>10</td>
</tr>
<tr>
<td>Hypoparathyroidism</td>
<td>5</td>
<td>Persistent cyanosis</td>
<td>5</td>
</tr>
<tr>
<td>Failure to gain weight</td>
<td>1</td>
<td>Cardiac anomaly without cath.</td>
<td>5</td>
</tr>
<tr>
<td>Jitteriness/hyper-activity; no specific cause</td>
<td>1</td>
<td>Murmur</td>
<td>5</td>
</tr>
<tr>
<td>Hyperbilirubinemia</td>
<td>10</td>
<td>Hemorrhagic diathesis</td>
<td>10</td>
</tr>
<tr>
<td>Chromosomal anomaly</td>
<td>10</td>
<td>Sepsis</td>
<td>10</td>
</tr>
<tr>
<td>Anemia</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SCORE:**

Without weight

With weight

Score is computed by addition of points: 0-5 = low; 6-9 = medium; ≥10 = high risk
### INTRAPARTUM CHRONOLOGICAL DATA COLLECTION FORM

**Directions:** Include triage and admission times, findings, interventions. Use specific times. Add options as necessary.

<table>
<thead>
<tr>
<th>Real Time</th>
<th>T</th>
<th>A</th>
<th>Options:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV/hypolock</td>
<td></td>
<td></td>
<td>1) AROM</td>
</tr>
<tr>
<td>Epi/dural</td>
<td></td>
<td></td>
<td>2) SROM</td>
</tr>
<tr>
<td>FSE</td>
<td></td>
<td></td>
<td>3) Cath</td>
</tr>
<tr>
<td>IUCP</td>
<td></td>
<td></td>
<td>4) VacExt</td>
</tr>
<tr>
<td>VagExam</td>
<td></td>
<td></td>
<td>5) Forceps</td>
</tr>
<tr>
<td>Drugs (list):</td>
<td></td>
<td></td>
<td>6) Cerv manip “slip tip”</td>
</tr>
<tr>
<td>Pain resps</td>
<td></td>
<td></td>
<td>7) Scalp pH</td>
</tr>
<tr>
<td>Fever</td>
<td></td>
<td></td>
<td>8) Scalp stim</td>
</tr>
<tr>
<td>Ctx - freq</td>
<td></td>
<td></td>
<td>9) Local Infl</td>
</tr>
<tr>
<td>Ctx - inten</td>
<td></td>
<td></td>
<td>10) IM</td>
</tr>
<tr>
<td>Ctx - dur</td>
<td></td>
<td></td>
<td>11) Mac</td>
</tr>
<tr>
<td>FHR base</td>
<td></td>
<td></td>
<td>12) NAV</td>
</tr>
<tr>
<td>Decel, Ear</td>
<td></td>
<td></td>
<td>13) MatExh</td>
</tr>
<tr>
<td>Decel, Lat</td>
<td></td>
<td></td>
<td>14) Anxiety</td>
</tr>
<tr>
<td>Decel, Var</td>
<td></td>
<td></td>
<td>15) Hyper BP</td>
</tr>
<tr>
<td>Decel, No Id</td>
<td></td>
<td></td>
<td>16) Hypo BP</td>
</tr>
<tr>
<td>Brady</td>
<td></td>
<td></td>
<td>17) Amnioninfus</td>
</tr>
<tr>
<td>Tachy</td>
<td></td>
<td></td>
<td>18) Ketones</td>
</tr>
<tr>
<td>Accel</td>
<td></td>
<td></td>
<td>19) Hunger</td>
</tr>
<tr>
<td>Var</td>
<td></td>
<td></td>
<td>20)</td>
</tr>
<tr>
<td>Options—→</td>
<td></td>
<td></td>
<td>21)</td>
</tr>
</tbody>
</table>

Data collector: __________  Data coder: __________
INTERVENTION STUDY CHART AUDIT FORMS

Directions: Put descriptions in spaces. Circle or check choices. Put a mark in each space to indicate it was not accidentally overlooked. Record military times. Initial and put subject ID code on every page. If [9XXX] is not offered as an a code for data not recorded, the data is assumed to be negative. Code as (0) No. Do not code while abstracting.

INTRODUCTORY INFORMATION FROM MEDICAL RECORDS SUMMARY SHEET (Usually 1st page after ADM divider)

(1) Enter the hospital record # for this subject: __ __ __ __

(2) Enter ID Code # for this subject: __ __ __ __
   (Enter this number while doing data entry. Last 3 digits after hyphen are the numerical order in which the case is entered into SPSS.).

ICD - 9 Codes and interpretation:

(3) ICD-9 Code __ __ __ __ Diagnosis________________
   [9]

(4) ICD-9 Code __ __ __ __ Diagnosis________________
   [8]

(5) ICD-9 Code __ __ __ __ Diagnosis________________
   [8]

(6) ICD-9 Code __ __ __ __ Diagnosis________________
   [8]

(7) Ethnicity: (0) African American__ (1) European American__ (2) Hispanic American__ (3) Asian American__ (4) Native American__ (5) Jewish__ (6) Expatriate, Specify origin: __ (7) Other__ Specify: [9]

(8) Date-time first seen/examined in L & D:
   __ / __ / __ [9]

   Time: __ __ [9]
   (This is not the official medical records admission time.)

4/94 Data Collector:__________

Data Coder:__________
Date-time discharged from hospital: ___/___/____
Time: ___ ___ ___ [9]

Parturient's date of birth: ___/___/___ [9]

Socioeconomic status: (0) Self pay__ (1) Health
insurance__ (2) Medicaid__ (3) Other, specify: [9]

Triage assessment: Record on Intrapartum Chronological
Data Collection Form. Be sure to note PROM, color of fluid,
prior triage assessments and prescriptions, if any.

Estimated weeks pregnant at admission in labor when
admitted in labor: ___:___ [99]

Oral intake before admission: (On L & D triage or admission sheet)

Did parturient eat anything before admission?
___ (0) No ___ (1) Yes, specify: [9]

Date-time food was eaten: ___/___/___ - ___

Amount of intake: (0) Light__ (1) Moderate__
(2) Heavy___ Specify (if available): [8, 9]

DEMOGRAPHIC DATA. (*data may be found on POPRAS admission form:
AP record if any; a yellow form on neonate's chart; also check physician's admission
narrative and pink social service sheet, if any, on parturient's chart.)

Marital status: (0) S__ (1) M__ (2) D__ (3) Separated__ (4)
Other___, specify: [9]

Prenatal care: (0) None__ (1) Private__ (2) Public__
(3) Other___ Specify: [9]

Planned anesthesia or pain control: (0) NCB__ (1)
Epidural__ (2) PRN__ (3) Analgesia__ (4) Undecided__
(5) Other Specify: [9]

Subject had CBE: (0) No__ (1) Yes__ [9]

Data Collector:_______
Data Coder:_______
Parturient's education: (0) <12 (1) HS/GED (2) 1-4 yrs college/AA (3) BS/A (4) >4 yr college (5) Graduate degree (6) Technical training (7) Other __ specify [9]

Parturient's occupation: (0) Unemployed/homemaker (1) Student (2) Skilled labor (3) Unskilled labor (4) Clerical (5) Sales (6) Professional (7) Other __ Specify [8, 9]

Mother smoker? (0) No (1) Yes, < 1 ppd during pregnancy (2) Yes, > 1 ppd during pregnancy (3) Yes, quit while pregnant [9]

Other known drug use? (0) No (1) Yes, but not while pregnant (2) Yes, while pregnant (3) Suspected, tox screen done If yes, specify drug used (including ETOH): [9]

Father of Baby: (0) Legal spouse (1) BF (2) Other (3) Unknown If other, specify ____________ [9]

Parity (total) (Attending's notes)

Gravida __________ [99]

Pregnancies carried to term: ________ [99]

Premature births: ________ [99]

Abortions: ________ [99]

Living children: ________ [99]

Specify variations or minor risk factors noted during antepartum or admission:

4/94 Data Collector: __________ Data Coder: __________
INTRAPARTUM (Use nurses' notes, attending's notes, IP flow sheets.)

Make out Intrapartum Chronological Data Forms now.

(30) Did the labor culminate with a cesarean birth: (0) No__ (1) Yes__

If yes, record only pertinent data items ** after decision for surgery is made unless SVD occurs. Do collect data for neonate.

**(31) Did parturient experience fever (>99.6F or 37.5C) during intrapartum: (0) No__ (1) Yes __ [9]

**(32) If yes, what was highest IP temperature recorded: [8, 9]

**(33) If yes, how many 1 hour periods of time did fever last: [8]

Neonate Procedures

(34) Was there a cord problem? (0) No__ (1) Nuchal X 1__ (2) Nuchal X 2__ (3) Nuchal X 3__ (4) Knot__ (5) Short__ (6) Vasa previa__ (7) Velamentous insertion__ (8) Other__ Specify: __ [9]

(35) Was neonate intubated: (0) No__ (1) Yes__ [9]

(36) Was there meconium below the cords: (0) No__ (1) Yes__ [8, 9]

(37) Was the neonate resuscitated: (0) No__ (1) Yes__ [9]

(38) Was oxygen administered: (0) No__ (1) Yes__ [9]

(39) Were stimulant drugs administered: (0) No__ (1) Yes__ [9]

Parturient Procedures

(40) Placenta: (0) Spontaneous__ (1) Expressed__ (2) Manual removal__ (3) Other__ Specify: [8, 9]

Data Collector: __________ Data Coder: __________
(41) What other procedures were done: (0) None (1) Uterine
    exploration (2) Curettage (gauze) (3) Other, specify:
    [8, 9]

(42) What was the estimated blood loss: _____________cc [9]

(43) Describe episiotomy attempt: (0) None (1) Midline
    (2) Mediolateral (3) Midline with 3rd degree extension
    (4) Midline with 4th degree extension (5) Mediolateral
    with 3rd degree extension (6) Mediolateral with 4th
degree extension (7) Other, Specify: [9]

(44) If episiotomy was not attempted, was the perineum intact:
    (0) No (1) Yes [8, 9]

    If perineum was not intact, ...

(45) ... was there a < 1st degree perineal laceration:
    (0) No (1) Yes [8, 9]

(46) ... was there a 1st degree perineal laceration:
    (0) No (1) Yes [8, 9]

(47) ... was there a 2nd degree perineal laceration:
    (0) No (1) Yes [8, 9]

(48) ... was there a 3rd degree perineal laceration:
    (0) No (1) Yes [8, 9]

(49) ... was there a 4th degree perineal laceration:
    (0) No (1) Yes [8, 9]

(50) ... was there a vaginal sulcus laceration:
    (0) No (1) Yes [8, 9]

(51) ... was there a periurethral laceration:
    (0) No (1) Yes [8, 9]

(52) ... was there a labial laceration:
    (0) No (1) Yes [8, 9]

(53) ... was there a cervical laceration:
    (0) No (1) Yes [8, 9]
(54) ... was the episiotomy or laceration repaired:
   (0) No (1) Yes [8, 9]

Please detail other outcomes and add variable, if necessary.

** (55) Who made the management decisions during labor:
   (0) CNM (1) FP (2) FP resident (3) OB (4) OB resident
   (5) Co managed by CNM-OB (6) Unknown
   If unknown, write in the name of all persons who appear to
   be making the decisions: [9]

(56) Who delivered the baby: (0) CNM (1) FP (2) FP
   resident (3) OB (4) OB resident (5) Other
   (6) Unknown If unknown, write in the name of the
   person who did according to the record: [9]

(57) Was a learner (CNM or medical student) present and
    participating at some time during the labor or delivery:
   (0) No (1) Yes

** Length of labor **

(58) Stage 1: [9]

(59) Stage 2: [8, 9]

(60) Stage 3: [8, 9]

** (61) Total LOL: [9]

** (62) Neonate's birth date-time ___ / ____ / ____
   Time: ___ ___ ___ [9]

(63) Placenta time: ___ ___ ___ [9]

** (64) Baby's gender: (0) Male (1) Female (2)
   Ambiguous [9]

4/94 Data Collector: _________

Data Coders: _________
**(65) Apgar Score: 1 minute_________ [99]

**(66) Apgar score: 5 minute_________ [99]
(Write in results of any Apgar 10)

**(67) Birth weight: _____ _____ _____ [9]

**(68) Feeding: (0) Breast___ (1) Bottle___ (3) Combination___ [8, 9]

**(69) Neonate record #: _____ _____ - _____ [99]

AT THIS POINT, COMPLETE A HOSPITAL RECORD REQUEST FORM FOR THE NEONATE

**Intrapartum Oral Intake** (I & O Sheet)

**(70) Did parturient have any oral intake during IP: (0) No___ (1) Yes___ If yes, write in the kinds: [9]

**(71) What was parturient's oral intake during IP only:________cc [8, 9]

(72) What was parturient's total IV intake:________cc [8, 9]

(73) Did Parturient receive oxytocics during 3rd stage: (0) No___ (1) Yes ___ If other than pitocin, specify: [9]

Specify any other pertinent data for IP:

**POSTPARTUM** (Check pp records, recovery notes, and physician's notes)

(74) After delivery, did parturient experience fever (>37.5): (0) No ___ (1) Yes ___ [9]

4/94 Data Collector:_________

Data Coder:_________
(75) If yes, what was highest PP temperature recorded: [8, 9]
(76) If yes, was fever during recovery immediately following delivery: (0) No (1) Yes [8, 9]
(77) If yes, was fever after recovery but before 24 hrs. post partum: (0) No (1) Yes [8, 9]
(78) If yes, was fever after 24 hrs. post partum: (0) No (1) Yes [8, 9]
(79) If yes, how many 1 hour time periods, continuously or intermittently, did fever occur: [8, 9]
(80) Were any post partum discomforts/problems, other than fever or pain, recorded in recovery room and post partum notes: (0) No (1) Yes [9]
(81) ... breast complaints (engorgement, let-down problems, etc.): (0) No (1) Yes
(82) ... nipple problems: (0) No (1) Yes
(83) ... problems voiding, bladder distention: (0) No (1) Yes
(84) ... fundus or involution: (0) No (1) Yes
(85) ... lochia: (0) No (1) Yes
(86) ... perineum: (0) No (1) Yes
(87) ... bowels: (0) No (1) Yes
(88) ... motor function: (0) No (1) Yes
(89) ... edema: (0) No__ (1) Yes __
(90) ... malaise, fatigue, tiredness, sleepiness: (0) No__ (1) Yes __
(91) ... insomnia: (0) No__ (1) Yes __
(92) ... depression:: (0) No__ (1) Yes __
(93) ... dizziness, vertigo: (0) No__ (1) Yes __
(94) ... hemorrhoids (0) No__ (1) Yes __
(95) ... anemia: (0) No__ (1) Yes __
(96) ... IV infiltration: (0) No__ (1) Yes __
(97) ... other complaints: (0) No__ (1) Yes __ Specify:
(98) Does the record indicate the parturient experienced pain during recovery or post partum: (0) No__ (1) Yes __ [9] If yes, where is/are the pain(s) located:
(99) ... perineum/episiotomy: (0) No__ (1) Yes __
(100) ... rectum: (0) No__ (1) Yes ___
(101) ... hemorrhoids: (0) No__ (1) Yes __
(102) ... IV site: (0) No__ (1) Yes __

Data Collector:_________  Data Coder:_________
Intervention Study - J. Kvale

Use [XXX] if not applicable; use [9XX] if not recorded or missing.

(103) ... leg(s): (0) No ___ (1) Yes ___

(104) ... muscle soreness: (0) No ___ (1) Yes ___

(105) ... bladder/urinary burning: (0) No ___ (1) Yes ___

(106) ... headache: (0) No ___ (1) Yes ___

(107) ... back pain: (0) No ___ (1) Yes ___

(108) ... uterine cramps: (0) No ___ (1) Yes ___

(109) ... pain with no location specified: (0) No ___ (1) Yes ___

(110) ... Other pain, specify: (0) No ___ (1) Yes ___

(111) Was pain medication given without charting any indication of pain: (0) No ___ (1) Yes ___ (Check medication sheet for pain medications given without notation. Use this option only if no other pain has been identified.)

Specify any other pertinent data for post partum:

**NEONATAL VARIABLES**

Directions: Probable location of data in parentheses. Add any other data you think may be important.

Be sure to recheck parturient record and complete any missing data. Especially check for 1) marks to the left of the number indicating missing data; 2) blank spaces; 3) other demographic data on pages 2-3.

(112) Discharge date-time: ___ / ___ / ___

Discharge time: ___ ___ ___ [9]

4/94 Data Collector: __________

ID CODE __________

(103) __________

LEGS

(104) __________

SORE

(105) __________

BURN

(106) __________

HEAD

(107) __________

BACK

(108) __________

CRMPS

(109) __________

NOLOC

(110) __________

PAIN2

(111) __________

MED

NDSHG

Data Coder: __________
ID CODE___________

(113) ICD-9 Code __ __ __ __ Morbidity:__________[9]

(114) ICD-9 Code __ __ __ __ Morbidity:__________[8]

(115) ICD-9 Code __ __ __ __ Morbidity:__________[8]

(116) ICD-9 Code __ __ __ __ Morbidity:__________[8]

Complete Hobel form now. If Hobel = 0, do not attach form. Record Hobel = 0 scores in items 127-128. Complete and attach any Hobel = > 0 form.

In addition to condition indicated with ICD-9 code and Hobel form, did neonate have:

(117) ... bruises: (0) No __ (1) Yes __

(118) ... forceps marks: (0) No __ (1) Yes __ [8]

(119) ... vacuum suction marks (caput, bruises): (0) No __ (1) Yes __ [8]

(120) ... non-pathological irritability, jitteriness, twitching, etc.: (0) No __ (1) Yes __

(121) ... other morbidity: (0) No __ (1) Yes __ Specify: (jaundice, petechiae, cephalohematoma?)

(122) If neonate experienced hyperthermia (>37.5C), what was highest temperature recorded: __ __ __ [8, 9]

(123) How many 15-60 minute periods of time was temperature elevated: __ [8, 9]

(124) What was the date-time of the first elevated temperature: __ __ __ __ __ __ __ __ __ __ [8, 9]

Data Collector:___________

Data Coder:___________
(125) What is unweighted Hobel score: ___ [999]

(126) What is weighted Hobel score:
(Use Hobel form to assign.) ___ [999]

(127) Neonate was noted to have good suck, good swallow, or ate well:
(0) No ___ (1) Yes ___ [9]

(128) Was neonate a consistently good eater:
(0) No ___ (1) Yes ___

(129) ... a mucousy baby:
(0) No ___ (1) Yes ___

(130) ... a sleepy baby:
(0) No ___ (1) Yes ___

(131) Was neonate reluctant to "latch on":
(0) No ___ (1) Yes ___ [8]

(132) Did neonate spit up or vomit frequently:
(0) No ___ (1) Yes ___

(133) Did neonate exhibit nipple confusion:
(0) No ___ (1) Yes ___ [8]

(134) Did neonate have other feeding problems:
(0) No ___ (1) Yes ___ Specify:

(135) Bonding behavior: (Check also recovery notes.)
(0) Good/excellent__ (1) Mixed/fair__ (2) Poor__ [8, 9]
(136) Neonate was returned to hospital for urgent care within the first 28 days: (0) No record at this hospital (1) Yes ___ If yes, specify: (Summarize morbidity or concern that brought baby back to hospital.) [8]

SICK

Please record neonate’s given name from the birth certificate to ease any future data retrieval:

Place other comments below:

4/94 Data Collector: ________ Data Coder: ________
CODING GUIDE FOR INTRAPARTUM CHRONOLOGICAL DATA FORM

Triage and/or Admission Data

1) What was the first date-time of any triage, admission, or intervention note on the day of hospital admission: __ __/___/____ - __:__

2) What was dilation at time of triage/admission: [99]

3) Was seconal prescribed and taken prior to admission: (0) No (1) Yes [9]

4) Were other drugs prescribed: (0) No (1) Yes If yes, specify [9]

5) Time IV/heplock started:

6) Time epidural started:

7) Was pain control (anesthesia/analgesia/ncb) adequate or satisfactory for this parturient: (0) No (1) Yes (2) No comment recorded [9]

8) Number of times epidural was redosed or restarted: (variable valid only for those Jan abstracted): __________ [8]

9) Time fetal scalp electrode attached:

10) # of times FSE reattached: [8]

11) Time IUPC placed:

12) Number of vaginal exams during latent (0-3.5 cm) phase:

4/94 Data Collector: _______

Data Coder: _______
13) Number of VE during active (4-6.5 cm) phase: 

14) Number of VE during transition (7-9.5 cm):

15) Number of VE during second stage (10 cm to birth):

16) Number of VE total:

17) What time was parturient clearly in the active phase:

18) What time was parturient clearly in transition:

19) What time was parturient clearly in 2nd stage:

20) Did fetus demonstrate variable decelerations: (0)
   No ___ (1) Yes ___ If yes, ...

21) What time was first variable deceleration noted:

22) Did fetus demonstrate late decelerations: (0) No
    ___ (1) Yes ___ If yes, ...

23) What time was first late deceleration noted:

24) Did fetus demonstrate early decelerations: (0) No
    ___ (1) Yes ___ If yes, ...

25) What time first noted:

26) Did fetus demonstrate decelerations that were not
    identified by type: (0) No ___ (1) Yes ___

27) If yes, what time first noted:

4/94 Data Collector: ________

Data Coder: ________
Intervention Study - J. Kvale

Use [8XXX] if not applicable; use [9XXX] if not recorded or missing.

28) Did variable/late decels occur before any drug administration: (0) No __ (1) Yes __ [8]
   IF NO,

29) Did decelerations begin after a smooth muscle stimulant (oxytocin, prostaglandin, was used: (0) No __ (1) Yes __ [8]

30) Did decelerations begin after an analgesic (demerol, morphine, other) was used: (0) No __ (1) Yes __ [8]

31) Did decelerations begin after an epidural anesthetic was started: (0) No __ (1) Yes __ [8]

32) Was lidocaine administered: (0) Not recorded __ (1) Yes __

33) If yes, when was lidocaine used: (0) To start IV/epholoc __ (1) To start epidural __ (2) For local infiltration/pudendal block __ (3) More than once __ [8, 9] Valid only for Jan's abstractions

34) Did fetus experience tachycardia: (0) No __ (1) Yes __

35) If yes, what time was tachycardia first recorded:

36) Did fetus experience bradycardia: (0) No __ (1) Yes __

37) If yes, what time was bradycardia first noted:

38) Did fetus experience FHR base line changes: (0) No __ (1) Yes __

39) If yes, what time first noted:

4/94 Data Collector:_________ Data Coder:_________
40) Did fetus demonstrate diminished or absent BTBV: (0) No (1) Yes [8, 9]
41) If yes, what time did this begin:
42) What was color of amniotic fluid: (0) Clear (1) Light meconium (2) Moderate meconium (3) Thick/heavy meconium (4) Meconium, not identified (5) Yellow (6) Bloody (7) Other [9]
43) Was scalp pH taken: (0) No (1) Yes [8]
44) Results of scalp pH: [88, 99]
45) Was scalp stimulation done: (0) No (1) Yes
46) Did parturient experience hyperstimulation or hypertonic labor: (0) No (1) Yes
47) Time of first occurrence:
48) Did parturient experience hypostimulation, uterine inertia, or arrested labor: (0) No (1) Yes
49) If yes, time of first occurrence:
50) Did the parturient experience an unphysiological change in contraction pattern: (0) No (1) Yes
51) What time was change first apparent:
52) How many times did parturient experience nausea or vomiting:
53) Did parturient experience maternal exhaustion: (0) No (1) Yes, no intervention required (2) Yes,
ID CODE ____________

53) _______________
   MATEXT

54) _______________
   HIBP

55) _______________
   LOBP

56) _______________
   LOBPRX

57) _______________
   ANX

58) _______________
   FROM

59) _______________
   ROMTIME

60) _______________
   AROM

61) _______________
   CATH

62) _______________
   SLIPPLIP

63) _______________
   ASST

64) _______________
   VACEXCT

65) _______________
   FORCEPS

66) _______________
   PIT

Data Collector: ________

Data Coder: ________
67) If yes, what time was drug started:
   ID CODE __________
   67) ________________ TIME

68) Were drugs (eg. terbutaline) used to inhibit labor: (0) No ___ (1) Yes ___
   ID CODE __________
   68) ________________ INHIB

69) Time:
   ID CODE __________
   69) ________________ TIME

70) Was an analgesic other than epidural given during labor: (0) No ___ (1) Yes ___
   ID CODE __________
   70) ________________ ANAL

71) What time was it first given:
   ID CODE __________
   71) ________________ TIME2

72) Was pudendal block used: (0) No ___ (1) Yes ___
   ID CODE __________
   72) ________________ PUDEN

73) Was paracervical block used: (0) No ___ (1) Yes ___
   ID CODE __________
   73) ________________ PARA

74) Was local infiltration used: (0) No ___ (1) Yes ___
   ID CODE __________
   74) ________________ LOCAL

75) Did the parturient (fetus) require oxygen during labor: (0) No ___ (1) Yes ___
   ID CODE __________
   75) ________________ OXYGEN

76) What other responses during labor did parturient have that have not been mentioned: Please write them in for coding at time of data entry:
   ID CODE __________
   76) ________________ OTHERS

77) List any other responses by parturient:

78) List any other responses by fetus:

MAKE NEW VARIABLES IN DATA ENTRY PROGRAM AS NECESSARY

4/94 Data Collector: __________ Data Coder: ___
APPENDIX E
UNIVERSITY HOSPITALS OF CLEVELAND
PATIENT CONSENT FOR INVESTIGATIONAL STUDIES

TITLE OF PROJECT:
Maternal and Neonatal Outcomes Associated with
Selected Intrapartum Interventions

DESCRIPTION OF STUDIES:
I have been asked to volunteer in research that studies the association between the nursing
and medical care activities that healthcare professionals provide during normal labor and birth and the
postpartum recovery of me and my baby. My doctor/midwife has approved my participation in
this research should I wish to do so.

I understand that a nurse researcher will be an observer during my labor and delivery. She will
sit quietly in an inconspicuous area of my room. All of my care during labor and birth will be provided
by hospital staff. To gather information about my obstetric history and postpartum recovery, the
researcher will consult my hospital record and that of my baby.

I understand that I may decide at any time to withdraw from participation in this research, even
though I agreed at first to participate. In that event, I understand that the observer will leave my
presence, and no further contact will occur with the researcher or observer. Routine care by hospital
staff will continue uninterrupted.

I understand there is no cost to me directly or indirectly for this research.

I understand that while the results of this research may be published or otherwise made
available to persons who may benefit from it, my name will not appear on any research documents.
The identity of me and my family will be protected.

I understand that if I have any questions about this research in the future, I may contact the
Principal Investigator, a doctoral candidate at Frances Payne Bolton School of Nursing, Case Western
Reserve University, at the following location.

Janice Keller Kvale, MSN, CNM, PhD Candidate
NO 204G, Frances Payne Bolton School of Nursing
Case Western Reserve University
10900 Euclid Avenue
Cleveland, OH 44106-4904
(216) 368-2540

Janice Keller Kvale has described to me what is going to be done, how it is going to be done,
the risks, hazards and benefits involved, and will be available for questions at 368-2540. I
understand that my decision to participate or not to participate in this study will not alter my usual health care.

In the use of information generated from this study, my identity will remain anonymous. I am aware that I may
withdraw from this study at any time. I further understand that in the event of physical injury or illness occurring
to me resulting from the research procedures, University hospitals will not provide free medical care or compen-
sation for lost wages. Further information with respect to this topic is available from the Office of the Chief
of Staff. I understand that by signing this consent form, I do not waive any of my legal rights nor does it relieve
investigators or suppliers of liability, but merely indicates that I have been informed about the research study in
which I am agreeing to participate. A copy of this form is available to me upon request.

Signature ____________________________________________ Age _____ Date _____

Parent or Guardian Signature (If subject is a minor) __________________________________________

Witnessed by ___________________________________________ Date _____

IRB (Signature of Project Investigator) __________________________ Date _____

(4/29)
UNIVERSITY HOSPITALS OF CLEVELAND
INSTITUTIONAL REVIEW BOARD FOR HUMAN INVESTIGATION

TO: Beverly L. Roberts

The University Hospitals Institutional Review Board has reviewed the proposal submitted by KVÄLE, Janice Keller MSN, CNM, Ph.D. Candidate

Entitled Maternal and neonatal outcomes associated with selected intrapartum interventions (10-93-325)

Please be advised that with respect to

[F] The rights and welfare of the individuals
[G] The appropriateness of the methods to be used to secure informed consent
[H] The risks and potential medical benefits of the investigation, the Board considers this project

[XX] FULLY ACCEPTABLE, WITHOUT RESERVATION
[ ] NOT ACCEPTABLE FOR REASONS NOTED

REMARKS:

November 2, 1993

[Signature]

November 23, 1993

[Signature]

FOR ORA USE: Type Project New [XX] No
Human Risk [ ] Yes [ ] Renewal [ ] Addendum

SOURCE OF SUPPORT:
[ ] Departmental [ ] Outside Funding

Agency (Potential) [ ] Agency Number

Are any of the following involved?
[XX] Yes, those checked

[XX] Minors
[XX] Fetuses
[ ] Abortuses
[ ] Prisoners
[ ] Pregnant Women
[ ] Mentally Retarded
[ ] Mentally Disabled

CC: Investigator, ORA

The RB operates under the following general assurances and identification numbers (CWRH: MUSE 0-0)

[ ] CWRH
[ ] 0-0
INVESTIGATOR Janice Kelle Kvale [ ] Family [ ] Student

Family Supervisor Dr. Claire M. Andrews (For Student Projects)

Department or School Nursing Telephone 368-3532

Project Title: Outcomes Related to Intrapartum Interventions

Beginning Date: July 1, 1994 Expected Duration: 1 year

Type of Support [x] Federal Grant Agency: ARRCR

[ ] Other Sponsor

[ ] Departmental

Hospital Sponsor's Name (where applicable)

Please provide a 2-3 page abstract or summary of the research project covering the points included in the attached instructions. If any of the categories do not apply please indicate so.

Approval for the submitted information:

Family Member: Dr. Claire M. Andrews Dept. or School Nursing

Date: March 14, 1993

Research Committee Recommendation (must supported project)

Exemption Status [ ] Yes [ ] No Company (45 CFR 46.101) No.

Exemption Review [ ] Yes [ ] No

Full Committee Review [ ] Yes [ ] No

Approved 3/27/93

[Signature]